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River to Sea Transportation
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Final Report

FEASIBILITY STUDY FOR TURN LANE IMPROVEMENTS

on Madeline Avenue at Nova Road

City of Port Orange



VHB
250 E. Robinson St.
Orlando, FL 32803

Final Report

**Feasibility Study for Turn Lane Improvements
on
Madeline Avenue at Nova Road**

Task Work Order TOF-VHB-06

Prepared for:



Prepared by:



Vanasse Hangen Brustlin, Inc.
Orlando, FL

April 2022

EXECUTIVE SUMMARY

This report presents the results of a feasibility analysis completed for the intersection of Madeline Avenue at Nova Road, located in the City of Port Orange, Volusia County, Florida. This report was prompted by an application by the City of Port Orange to evaluate the feasibility of construction of the following improvements along Madeline Avenue:

- Extend the existing westbound and eastbound left turn lanes
- Add exclusive eastbound and westbound right turn lanes

The purpose of constructing exclusive right turn lanes and extending the left turn lanes is to reduce delays for turning vehicles and through vehicles and to assist in maintaining the functional capacity of Madeline Avenue.

Based upon the crash analysis, qualitative assessment, field observations, intersection analysis, Benefit/Cost (B/C) analysis, engineering judgment, and input from FDOT, both short-term and long-term considerations are recommended to improve the safety and operation of the study intersection. *The short-term improvements are developed in coordination with FDOT and can be constructed as soon as possible. The long-term improvements include the extension of left turn lanes and addition of exclusive right turn lanes on eastbound and westbound Madeline Avenue and other improvements that will be constructed along with these capacity enhancements.*

Short-term Recommendations

- Replace the existing permissive-only left turn phase for the eastbound and westbound left turn movements with a protected-only phase. The protected-only left turn phase is recommended because concurrent eastbound and westbound left turn movements cannot be accommodated safely at the study intersection. A separate structural analysis of the existing mast arms must be completed before the installation of three-section signal heads for the eastbound and westbound protected-only left turn phases.
- Increase pedestrian safety with improved lighting (Please note that this recommendation was included in the intersection lighting project (FPID 439881-1) along Nova Road)
- Install flexible retroreflective backplates for all signal heads

- Install ADA-compliant detectable warnings on pedestrian ramps
- Install FTP-68B-06 sign panels to replace sign stickers at pedestrian pushbuttons
- Refresh yellow median nose painting and install reflective pavement markers (RPMs)
- Add guide striping for all the four left turn movements

The short-term considerations are illustrated in **Figure ES-1**.

Long-term Recommendations

- **Extend the existing eastbound left turn lane to a storage length of 295 feet and provide an exclusive right turn lane with a storage length of 220 feet as shown in Figure ES-2.** Based on the conceptual designs of the proposed improvements, it is anticipated that the eastbound approach improvements on Madeline Avenue would not need additional ROW. Please note that for the eastbound proposed improvements, the northside roadway edge (along Madeline Avenue) was held to minimize right-of-way impacts and the proposed concept strives to provide an efficient design.
- **Extend the existing westbound left turn lane to a storage length of 270 feet and provide an exclusive westbound right turn lane with a storage length of 220 feet as shown in Figure ES-3.** It is anticipated that the westbound approach improvements on Madeline Avenue would need additional ROW of approximately 0.209 acres.
- Reconstruct traffic signal to meet current FDOT standards
- Install pedestrian detector stations with new pushbuttons to meet ADA criteria for the following:
 - West leg at the northwest and southwest corners
 - East leg at the northeast and southwest corners
 - North leg in both directions in the median
 - South leg at the southeast corner
- Install intersection lighting to meet horizontal and vertical illuminance criteria per current FDOT standards as mandated when reconstructing a signalized intersection

The long-term modifications can be implemented at an approximate construction cost of \$1,162,410 (2025 value) and yields a B/C ratio of 8.4 which indicates that the anticipated benefits outweigh the estimated costs for this recommended alternative.



REVISIONS				VANASSE HANGEN BRUSTLIN, INC. 225 E. ROBINSON STREET ORLANDO, FL 32801	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			Roadway Improvement Diagram Westbound Madeline Ave at Nova Rd	Figure No.
DATE	DESCRIPTION	DATE	DESCRIPTION		ROAD NO.	COUNTY	FINANCIAL PROJECT ID		ES-3
						VOLUSIA			

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INTRODUCTION

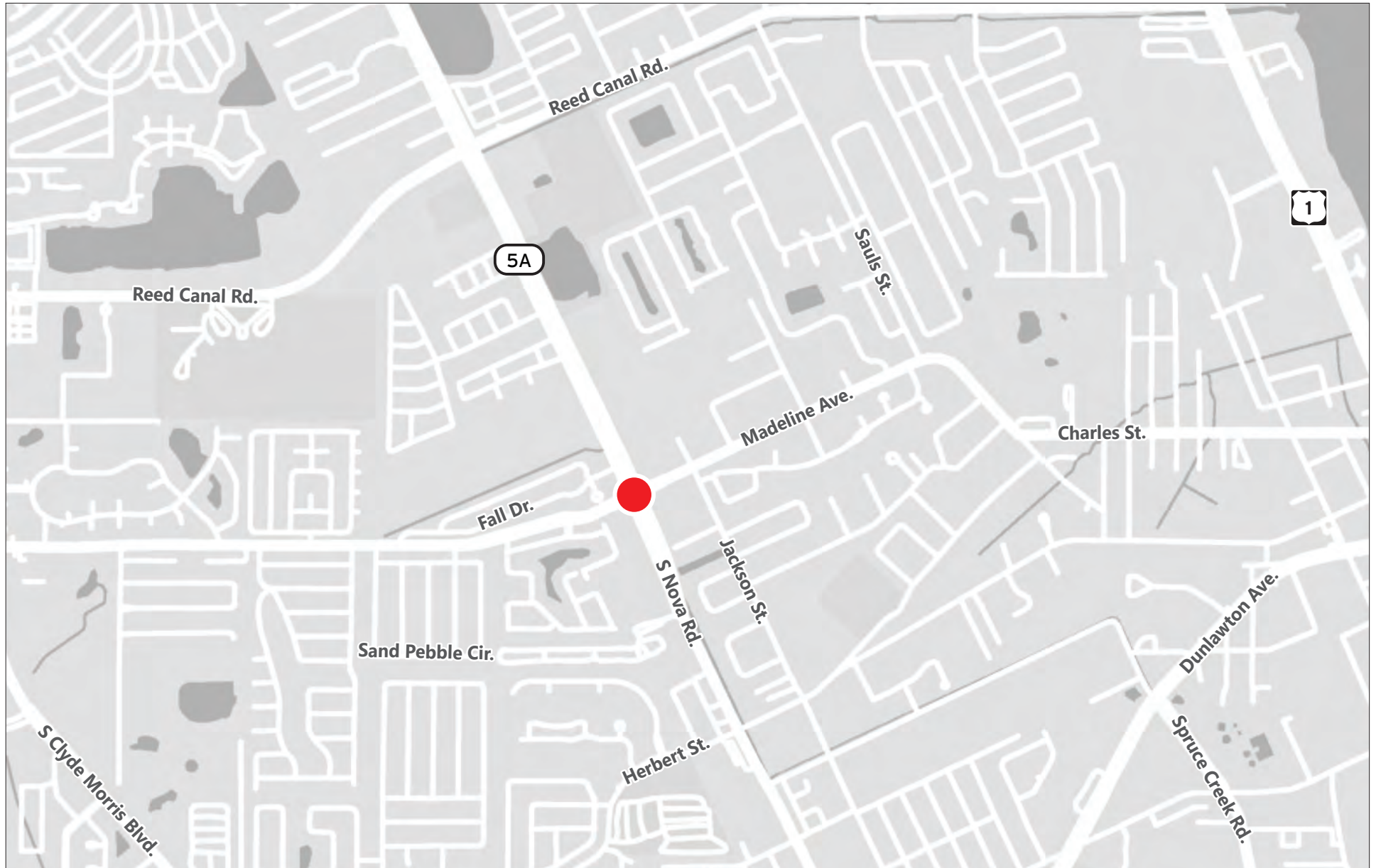
VHB, Inc. was retained to perform a feasibility analysis study for turn lane improvements at the intersections of Madeline Avenue at Nova Road, located in the City of Port Orange, Volusia County, Florida, as illustrated in **Figure 1**. This study was initiated by an application by the City of Port Orange to evaluate the feasibility of the below improvements at the study intersection:

1. Extend the existing westbound and eastbound left turn lanes
2. Add exclusive eastbound and westbound right turn lanes

As mentioned in the feasibility application, the intent of the proposed improvements is to reduce delays for turning vehicles and through vehicles by allowing increased stacking area to segregate vehicles departing Madeline Avenue from through traffic and to assist in maintaining the functional capacity of Madeline Avenue.

The analysis methods used in completing this study are consistent with the Manual on Uniform Traffic Control Devices (MUTCD), the Manual on Uniform Traffic Studies (MUTS), the Traffic Engineering Manual (TEM), Florida Department of Transportation (FDOT) Design Manual (FDM), and engineering judgment. The remainder of this report documents existing conditions, vehicle and pedestrian counts, qualitative assessment, crash analysis, intersection analysis, B/C analysis, and recommendations. The analysis will not only consider the benefits and feasibility of extending the left turn lanes and addition of right turn lanes at the study intersection as mentioned above, but also safety and other intersection improvements.

The current document is revised to address the comments received from the City of Port Orange, Volusia County, River to Sea Transportation Planning Organization (R2CTPO), and FDOT on the draft report submitted in February 2022. The responses to comments are provided in **Appendix A-1**.



● Project Location



Figure 1

Project Location Map
Madeline Avenue &
Nova Road Intersection

EXISTING CONDITIONS

Field Inventory

The intersection of Madeline Avenue at Nova Road is in the City of Port Orange, Volusia County, Florida. The characteristics of the study intersection are presented in **Table 1. Figure 2** depicts the existing conditions including the general roadway geometry, pavement markings, land use, and intersection traffic control of the study intersections. The conditions stated in this report reflect conditions as observed on the date of the qualitative assessment.

Table 1: Field Inventory

Features	Madeline Avenue at Nova Road
Main Street	Madeline Avenue (east-west); two lane undivided urban major collector
Minor Street	Nova Road (north-south); six lane divided urban principal arterial
Intersection Type	4-legged intersection
Number of Intersection Approach Lanes	Northbound – 1 left turn lane, 2 through lanes & 1 shared through/right turn lane Southbound – 1 left turn lane, 2 through lanes & 1 shared through/right turn lane Eastbound – 1 left turn lane & 1 shared through/right turn lane Westbound – 1 left turn lane & 1 shared through/right turn lane
Roadway Maintenance	Madeline Avenue – City of Port Orange Nova Road - FDOT
Traffic Control	Signal
Speed Limit	Madeline Avenue – 25 mph (west leg)/35 mph (east leg) Nova Road – 50 mph
Bicycle Lanes	No bicycle lanes on Madeline Avenue Exclusive bicycle lanes are provided on Nova Road in both directions
Sidewalks	Madeline Avenue (west leg) – full coverage on south side of the roadway, partial coverage on north side Madeline Avenue (east leg) – full coverage on north side of the roadway only Nova Road – full coverage provided on both sides of the roadway
Surrounding Development	Northwest: BP Gas Station and Convenience Store Northeast: Vacant Land Southwest: Mobil Gas Station/7-Eleven Convenience Store Southeast: Port Orange Stables
Nearest Signalized intersections	Madeline Avenue – No signalized intersection to the east Madeline Avenue & Clyde Morris Boulevard - 1.27 miles to the west Nova Road & Reed Canal Road - 0.75 miles to the north Nova Road & Herbert Street – 0.51 miles to the south
Roadway Lighting	Streetlights - northwest corner of the intersection (mounted on a utility pole)



REVISIONS				STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			MADELINE AVE AND NOVA RD CONDITION DIAGRAM	FIGURE NO. 2
DATE	DESCRIPTION	DATE	DESCRIPTION					
				ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
					VOLUSIA			

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Traffic Volume Data

Two 24-hour volume approach counts were collected – one on Madeline Avenue west of Nova Road and the other on Nova Road, south of Madeline Avenue, on 12/07/2021, representing a typical commuter weekday. The 24-hour volume traffic counts were supplemented with 8-hour intersection turning movement counts (TMCs). The TMCs were collected between 7:00 AM – 9:00 AM, 11:00 AM – 1:00 PM and 2:00 PM – 6:00 PM at the study intersection. These hours represent the highest eight hours obtained from the volume counts. From this data, the AM and PM peak traffic hours were found to occur from 7:30 AM to 8:30 AM and 4:30 PM to 5:30 PM. The overall peak hour for the intersections was found to occur during the PM peak hour. The TMCs revealed that traffic along Madeline Avenue peaks in the eastbound direction during both AM and PM conditions and the traffic along Nova Road peaks in the northbound direction during the AM peak hour and southbound direction during the PM peak hour. The 24-hour volume count, 8-hour TMCs and pedestrian/bicycle counts are provided in **Appendix A-2**. The **Table 2** summarizes the distribution of turning movements at the study intersection.

Table 2: 8 Hour Turning Movement Percentages (All Vehicles)

Study Intersection	Movement	Northbound	Southbound	Eastbound	Westbound
Madeline Avenue at Nova Road	Left turn/U-turn	13.10%	5.06%	25.27%	20.61%
	Through	83.29%	84.84%	30.94%	51.09%
	Right-turn	3.61%	10.11%	43.79%	28.31%

The field collected 2021 TMCs were compared and adjusted based on the 2019 TMC data provided by the County for AM and PM peak hours. **Figure 3** provides the 2021 AM and PM peak hour turning movements counts for the study intersection.

Existing Operational Analysis

The existing operating conditions were determined using Synchro 11 software. The signal timing information was provided by Volusia County. **Table 3** summarizes the intersection delay, levels of service (LOS), and volume over count (V/C) ratios at the study intersection during the AM and PM peak periods. The synchro results are provided in **Appendix B**. As shown in **Table 3**, eastbound and westbound approaches along Madeline Avenue were found to operate at LOS D or E.

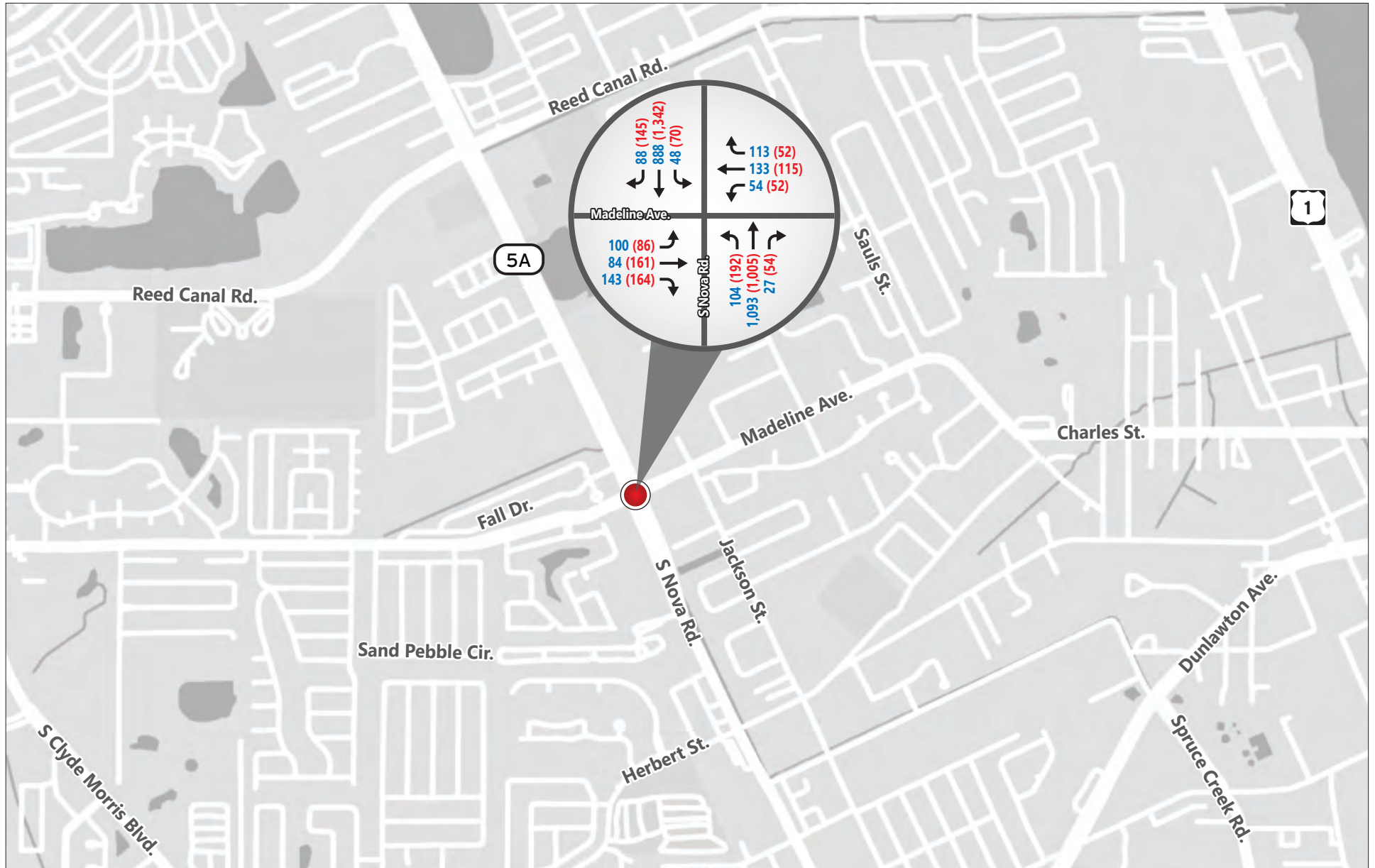


Figure 3

Existing TMCs
Madeline Avenue & Nova Road Intersection

Table 3: Existing Operational Analysis Results for Madeline Avenue at Nova Road

Approach	Existing AM			Existing PM		
	Delay (sec/veh)	LOS	V/C Ratio*	Delay (sec/veh)	LOS	V/C Ratio*
Eastbound	57.8	E	0.78	72.3	E	0.85
Westbound	54.1	D	0.67	64.2	E	0.70
Northbound	27.3	C	0.65	31.9	C	0.81
Southbound	28.0	C	0.45	33.1	C	0.59
Overall	33.8	C	0.78	39.3	D	0.85

Note: * V/C Ratio – Volume over count ratio; The maximum value is reported for each movement and the overall intersection

A lost time adjustment of 3.0 seconds was added to eastbound and westbound left turn lanes to replicate the field observed queues for these movements. A summary of the pedestrian and bicycle LOS analysis at the signalized study intersections is included in **Table 4**. As shown in this Table, both the pedestrian and bicycle modes are found to operate at LOS D or better during both the AM and PM peak hours. The pedestrian and bicycle LOS values reported are based on the HCM 6th Edition methodologies. Pedestrian LOS at a signalized intersection is based on factors such as the number of traffic lanes crossed, disturbance caused by motorized vehicle traffic (traffic volumes, turning types, etc.), and the presence of channelized right turns. The bicycle LOS at a signalized intersection is based on factors such as the presence of bicycle lanes and/or paved shoulders, separation from motorized vehicle traffic, traffic volumes and speeds, and heavy vehicle percentage.

Table 4: Existing Multimodal Analysis Results for Madeline Avenue at Nova Road

Peak Period	Pedestrian Mode LOS				Bicycle Mode LOS			
	EB	WB	NB	SB	EB	WB	NB	SB
AM Peak	B	B	C	C	D	D	B	B
PM Peak	C	B	C	C	D	C	B	B

Left Turn Phase Warrant Analysis

Based on FDOT's input, a left turn phase warrant analysis was performed for the eastbound and westbound left turn movements. It should be noted that since the left turn phase warrant analysis is outside the current study scope, data that was not collected for this warrant analysis was borrowed from the Left Turn Phase Warrant Study completed by FDOT for Nova Road and Madeline Avenue in 2019. The analysis results for the eastbound left turn movement show that the warrant is satisfied based on left turn delay estimated by Synchro. However, the warrant is not satisfied for the westbound left turn movement. The recommendation for a consideration of a protected phase for the eastbound and westbound left turn movements in the existing conditions is discussed in the following sections of this report. The warrant analysis sheets are provided in

Appendix B.

Crash Data

The latest available five years of crash data (from January 1, 2017 to December 15, 2021) at the study intersections were obtained from Signal Four Analytics. Raw crash data is included in **Appendix C**.

As shown in **Table 5**, there were 64 crashes reported within the influence area of the Madeline Avenue at Nova Road intersection. They consisted of 25 rear end, 13 left turn, 8 sideswipe, 8 angle, 5 off road, 2 right turn, 1 rollover, 1 other, and 1 pedestrian/bicyclist related crashes. The crashes caused 27 injury crashes and 1 fatality and total damages amounted to approximately \$9,550. One fatality occurred in the year 2020 and 1 pedestrian/bicyclist crash occurred in 2021. 66% of the crashes occurred in daylight conditions and the remaining 34% crashes occurred in dark or dusk conditions. Pavement condition was dry for 55 crashes, and wet for 9 crashes. In addition to the significant number of rear end crashes (which are typical at a signalized intersection), a significant number of left turn and angle crashes were also observed at the study intersection.

Fatality Crash (#24032474), August 8, 2020: A vehicle making EBL was struck by a vehicle travelling SBT at the intersection. After being struck, the turning vehicle spun onto the curb, ejecting the driver in the process.

Pedestrian/Bicyclist Crash (#89398892), August 6, 2021: A bicyclist attempted to cross Nova Road diagonally from the north median island to the southwest corner, facing away from traffic. The southbound travelling vehicle had a green signal, striking the cyclist in the middle of the travel lane.

Table 5: Madeline Avenue at Nova Road – Crash Summary (01/01/2017 and 12/15/2021)

Crash Type	2017	2018	2019	2020	2021	Total	Proportion
Rear End	5	4	7	6	3	25	39%
Head On	0	0	0	0	0	0	0%
Sideswipe	0	1	3	2	2	8	13%
Rollover	0	0	0	1	0	1	2%
Angle	3	0	2	2	1	8	13%
Left Turn	2	3	2	2	4	13	20%
Right Turn	0	0	0	0	2	2	3%
Off Road	1	1	1	2	0	5	8%
Pedestrian & Bicycle	0	0	0	0	1	1	2%
Animal	0	0	0	0	0	0	0%
Other	0	0	1	0	0	1	2%
Total	11	9	16	15	13	64	100%
Crash Severity	2017	2018	2019	2020	2021	Total	Proportion
Fatality	0	0	0	1	0	1	3%
Injury	6	4	5	7	5	27	82%
Property Damage Only	1	0	0	3	1	5	15%
Total	7	4	5	11	6	33	100%
Pavement Condition	2017	2018	2019	2020	2021	Total	Proportion
Wet	1	0	4	2	2	9	14%
Dry	10	9	12	13	11	55	86%
Slippery	0	0	0	0	0	0	0%
Total	11	9	16	15	13	64	100%
Light Condition	2017	2018	2019	2020	2021	Total	Proportion
Daylight	8	6	10	9	9	42	66%
Dusk	1	0	0	1	0	2	3%
Dawn	0	0	0	0	0	0	0%
Dark	2	3	6	5	4	20	31%
Total	11	9	16	15	13	64	100%
Under the Influence	2017	2018	2019	2020	2021	Total	Proportion
Alcohol	0	1	1	1	1	4	6%
Drugs	0	0	0	1	0	1	2%
Total	0	1	1	2	1	5	8%

QUALITATIVE ASSESSMENT

A qualitative assessment (QA) was conducted at the study intersection in the field to evaluate the existing operating conditions occurring on a typical weekday, and to identify areas where improvements would be potentially beneficial to the overall safety and efficiency of the location. A registered professional engineer performed the QA during the AM and PM peak hour periods (including school opening and closing times). The field observations are summarized as follows:

Traffic

AM Peak Period (7-9 AM)

- Substantial queueing was noted along both the eastbound and westbound approaches (Madeline Avenue), with heavier traffic on the westbound approach. Vehicle queueing of up to 18 vehicles was observed on the westbound approach with less frequent congestion on the eastbound approach (up to 10 vehicle queues were observed).
- Notably, the heavy conflict between westbound through movements and eastbound left turn movements would frequently result in eastbound left turning vehicles entering and waiting in the intersection and completing the movement after the end of the phase. Similar situations also occurred for the westbound left turning movement, albeit less frequently.
- In some instances, eastbound and westbound queues were not cleared by the end of the phase. It was also noted that the available left turn storage on these approaches were not exceeded, most likely because of the through/right turn movement queues blocked the left turning vehicles.
- It is noted that vehicles exiting the Mobil driveway onto the eastbound approach were blocked by the queued through/right turn movement vehicles, however the Mobil exiting traffic was generally low and did not result in any significant conflicts.
- Very little congestion was observed along the northbound and southbound approaches (S Nova Road), with one exception. The northbound left turning vehicles were observed to exceed the available storage length by one or two vehicles in some instances.

- No drivers were observed skipping the queue to enter the left turn storage. Drivers along Nova Road generally travelled much faster due to the higher speed limit, available capacity, and lack of congestion.

PM Peak Period (3-5 PM)

- The observations on the westbound approach were similar to the AM observations, however it was noted that the eastbound approach experienced heavier traffic and queueing (up to 18 vehicles). Similar issues were observed with up to three vehicles waiting in the intersection to perform the permitted eastbound left turn.
- Queue storage for the eastbound left exceeded during several cycles (up to 8 vehicles).
- On the northbound and southbound approaches, queues of up to 10 vehicles were observed, however were able to clear the intersection in a single cycle.
- Due to the heavier eastbound queueing in the evening, it was common to see commuters skipping the through/right queue, travelling through the median or opposite lane to enter the left turn storage. Similar speeds were observed for the approaches as in the AM peak.

Paint and Signage

Pavement markings and signage on Nova Road are in fair condition, however, the pavement markings on Madeline Avenue are faded. Pedestrians/bicyclists crossing Nova Road must cross in two stages because of the existing width of the roadway. The eastbound and westbound left turn movements operate under permissive phase only. It was also noted that reflective backplates were not installed on signal heads.

Pedestrians and Cyclists

No pedestrians or cyclists were observed crossing any approach in the AM or PM periods, most likely because of the absence of significant pedestrian/bicycle generators near the study intersection.

ADA Related Observations

Curb ramps are present and at an acceptable slope, with median refuge provided in the center of Nova Road. Pushbuttons are provided on the corners of the intersection and on the median refuges. Curb ramp warning pads appear to have been previously installed at the intersection corners but have since been completely removed.

FEASIBILITY ANALYSIS

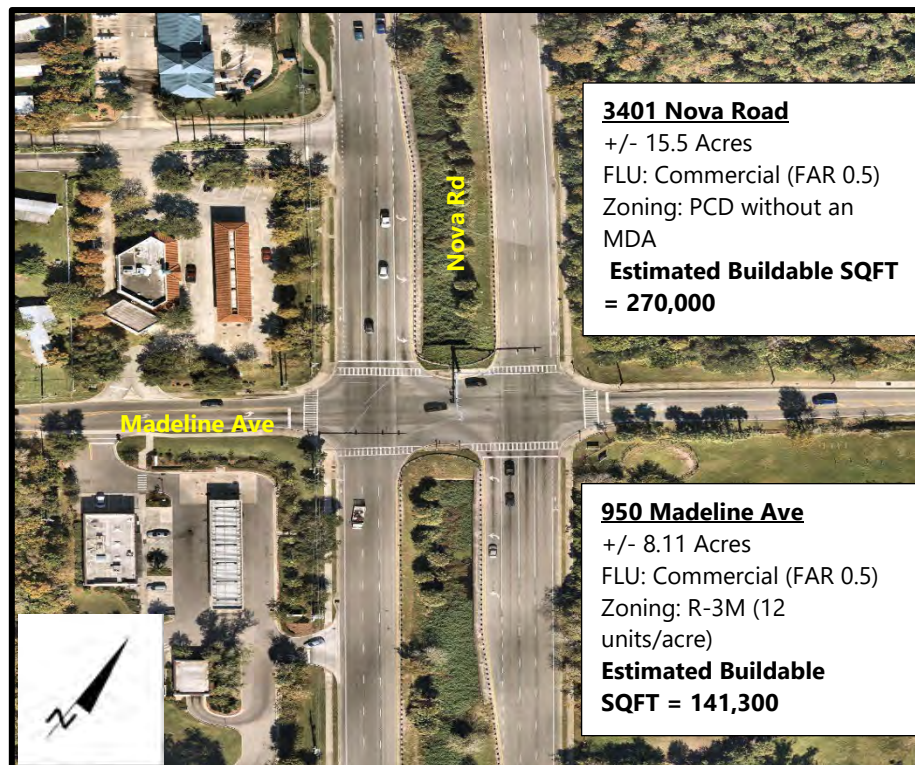
Background

The City of Port Orange submitted an application to perform a feasibility study to construct the following improvements along Madeline Avenue at Nova Road:

1. Extend the existing westbound left turn lane and eastbound left turn lane
2. Add an eastbound right turn lane and a westbound right turn lane

The purpose of constructing exclusive right turn lanes and extending the left turn lanes is to reduce delays for turning vehicles and through vehicles by allowing increased stacking area to segregate vehicles departing Madeline Avenue from through traffic and to assist in maintaining the functional capacity of Madeline Avenue. As per the pre-scoping meeting held on September 14, 2021, there was also a discussion about the future traffic volume growth due to the potential developments in the northeast and southeast corners of the study intersection (shown in **Figure 4**). In addition to the capacity improvements, safety improvements are also considered in this study and are explained in the following sections of this study.

Figure 4: Potential Developments – Madeline Avenue at Nova Road



Site Assessments for Proposed Improvements

This section provides a brief assessment of the sites that can be considered before constructing the proposed roadway improvements. To construct exclusive right turn lanes, the following elements will need to be accounted for:

Eastbound

- A parcel agreement will be needed to reconstruct the driveway and harmonizing treatments
- Existing inlet needs to be modified to a manhole and a new inlet constructed at the proposed curb line
- Removal of +/-30" oak tree
- Reconstruct SW corner ramps and update pedestrian features.
- Existing signal adjustments
- Pavement markings
- Underground utilities cannot be determined, but above ground evidence is as follows:
 - Waterline and Sewer
 - Miscellaneous irrigation

Westbound

- To provide a 12-foot border width per FDM 210.7.1, an eight-foot-wide swath of private property will need to be acquired for right-of-way use. The agreement will need to include driveway reconstruction (south parcel) and harmonizing treatments
- North Side: Two existing inlets need to be modified to a manhole and two new inlets constructed at the proposed curb line
- South Side: Extend pipe run/MES 250 linear feet to the east with one new inlet constructed at the proposed curb line
- Existing signal adjustments
- Reconstruct northeast corner ramps and update pedestrian features
- Relocate aboveground utilities, 6 poles
- Underground utilities cannot be determined, but above ground evidence is as follows:
 - Gas line
 - Waterline

Methodology

The methodology for determining the feasibility of implementing the proposed improvements includes performing a comparison of before (No-Build) and after (Build) operating conditions at study intersection utilizing traffic operation analysis software (Synchro 11) and preparing a B/C analysis for the proposed improvements. The No-Build condition represents the existing intersection configuration, and the Build condition represents the capacity improvements as well signal improvements.

It should be noted that short-term signal and ADA improvements (that can be built by FDOT as soon as possible) are also included in the study recommendations, for which a B/C ratio was not calculated.

Future Traffic Development

The development of traffic projections for the study intersection required the examination of historical growth, proposed development levels within vicinity, and a basic understanding of local traffic circulation patterns and travel characteristics. As such, the following sources were used to derive reasonable future traffic forecasts.

- **Population Projections:** The population estimates obtained from the most current Bureau of Economic and Business Research (BEBR), Florida Population Studies, Volume 54 Bulletin 189, dated April 2021 was used. The low, medium, and high population projections for 2045 are summarized in **Table 6**. The growth rates between 2020 and 2045 population projections range from approximately 0.07% percent to 1.62% percent per year for Volusia County. BEBR population study data is included in **Appendix D**.
- **Historical Traffic Trends Analysis:** Historical traffic trends analysis based on least squares regression analysis was conducted for the study roadways using traffic data from the 2019 Volusia County Traffic Count Program. The trends-based annual growth rate is calculated at 0.1% and 0.3% for Nova Road north and south of Madeline Avenue, respectively. This analysis was not conducted for Madeline Avenue because traffic count data was not available for last seven years. The trends analysis sheets are provided in **Appendix D**.

- **Approved Developments:** The project trips from the potential developments in the northeast and southeast corners of the study intersection with a build-out date of 2025 were added to the background traffic. It was assumed that 25% of the developable area will be developed by Year 2025.

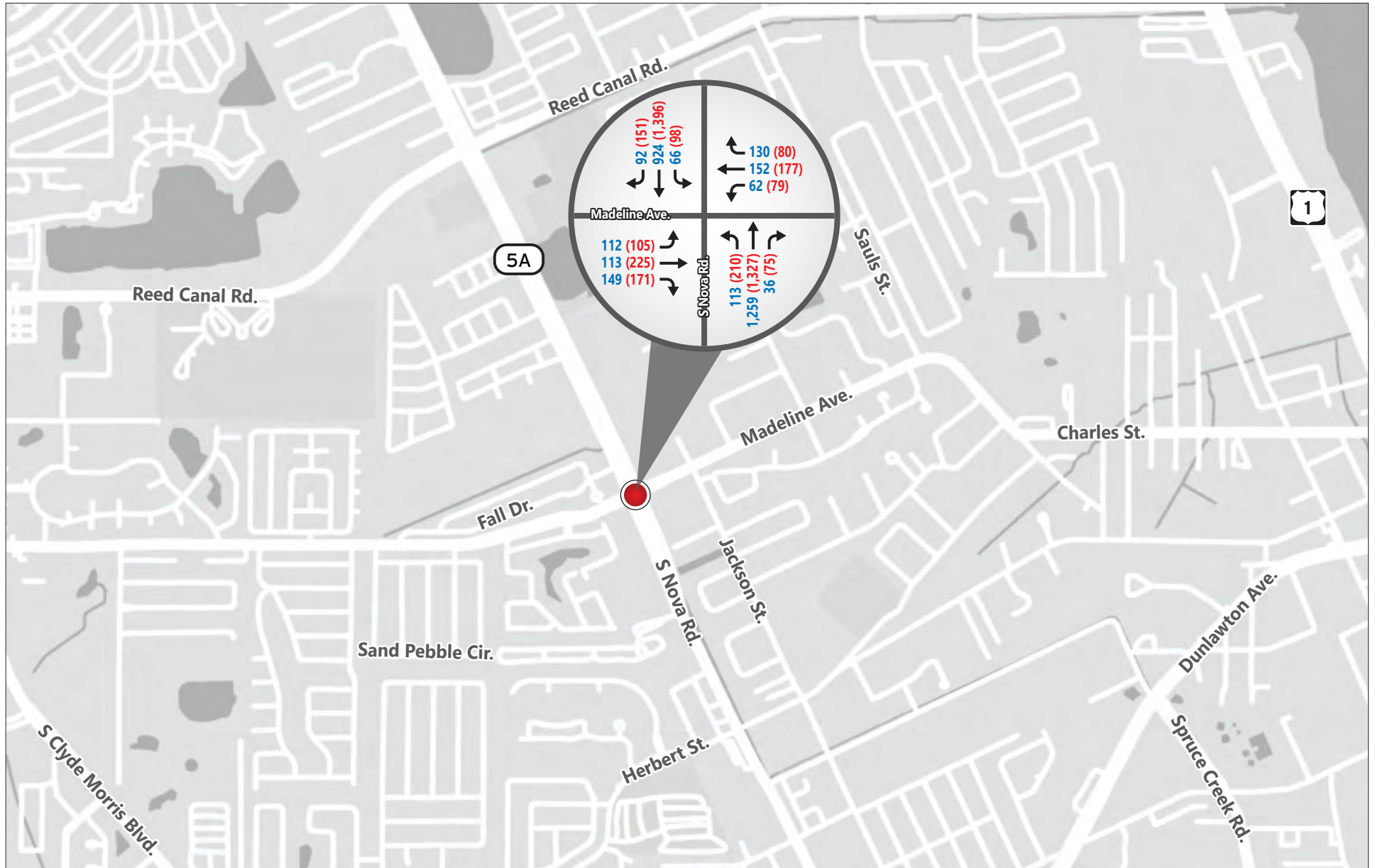
Table 6: BEBR Population Growth

County	2020 Population Estimate	Future Year 2045		
		Projection Type	Population Projection	Annual Growth Rate
Volusia	551,588	Low	561,900	0.07%
		Medium	662,000	0.80%
		High	774,300	1.62%

The following assumptions were made per the stakeholder meeting held on January 4, 2022:

- Based on a comparison of annual growth rates from the two primary sources (BEBR population estimates, and historical trends analysis), a simple annual growth rate of 1.0% was used to derive the year 2025 background turning movement volumes (from the year 2021 volumes).
- 25% of the project trips from potential developments along Madeline Avenue (full access) and 75% along Nova Road (right in right out only) were added to the background trips for the year 2025.

Figure 5 provides the 2025 AM and PM turning movement volumes for the study intersection. All the supporting documents – including the BEBR report, TRENDS analyses, future land-use and zoning, Institute of Transportation Engineers (ITE) Trip Generation sheets, and background plus project trip calculations are provided in **Appendix D**.



Project Location

AM (PM)

Peak Hour Traffic Volumes



Traffic Movement



Figure 5

2025 TMVs
Madeline Avenue &
Nova Road Intersection

2025 Operational Analysis

The 2025 operational analysis was performed for the proposed alternative at study intersection for before and after conditions. The before conditions assume that there is no change in intersection geometry and signal timings, whereas the after conditions assume improvements under the proposed alternative. As used for the existing conditions analysis, the 2025 operating conditions were determined using Synchro 11 software. **Table 7** summarizes the intersection delay and LOS at each study intersection for before (No-Build) and after (Build) conditions during the two peak periods.

The following recommended storage lengths are determined based on operational analysis and using a total deceleration distance of 145 feet for a design speed of 35 mph in urban conditions:

- Eastbound Left Turn – 295 feet
- Eastbound Right Turn – 220 feet
- Westbound Left Turn – 270 feet
- Westbound Right Turn – 220 feet

A summary of the pedestrian and bicycle LOS analysis at the signalized study intersections is included in **Table 8**. As shown in this Table, both the pedestrian and bicycle modes are found to operate within LOS D during both the AM and PM peak hours. The synchro results are provided in **Appendix E**.

Table 7: 2025 Operational Analysis Results for Madeline Avenue at Nova Road

Approach	2025 AM Peak Hour						2025 PM Peak Hour					
	Before (No-Build)			After (Build)			Before (No-Build)			After (Build)		
	Delay (Sec.)	LOS	V/C Ratio	Delay (Sec.)	LOS	V/C Ratio	Delay (Sec.)	LOS	V/C Ratio	Delay (Sec.)	LOS	V/C Ratio
Eastbound	103.9	F	1.25	39.9	D	0.74	75.5	E	0.89	50.9	D	0.79
Westbound	65.1	E	0.79	36.2	D	0.64	89.4	F	1.14	54.9	D	0.69
Northbound	29.3	C	0.67	32.1	C	0.64	36.4	D	0.82	37.5	D	0.82
Southbound	28.8	C	0.53	36.2	D	0.63	40.9	D	0.68	43	D	0.81
Overall	41.6	D	1.25	34.8	C	0.74	47.4	D	1.14	43.1	D	0.82

Note: * V/C Ratio – Volume over count ratio; The maximum value is reported for each movement and the overall intersection

Table 8: 2025 Multimodal Analysis Results - Before and After

Peak Period	Pedestrian Mode LOS				Bicycle Mode LOS			
	EB	WB	NB	SB	EB	WB	NB	SB
2025 No-Build (Before)								
AM Peak	B	B	C	C	D	D	B	B
PM Peak	C	B	C	D	D	D	B	B
2025 Build (After)								
AM Peak	C	B	C	C	D	D	B	B
PM Peak	C	C	C	D	D	D	B	B

B/C Analysis

A B/C analysis was performed for the study intersection based on traffic operational and safety benefits for the proposed improvements. To determine the benefits, the year 2025 operational analysis results for the No-Build and Build conditions and the adjusted year 2025 improvements cost were used. The following sections describe the overall process.

Traffic Operational Benefits

To estimate the operational benefits of the proposed intersection improvements, Synchro reported networkwide measures of effectiveness (MOEs) were used. The operational benefits of the proposed intersection improvements are defined in terms of annualized cost savings associated with reductions in the following two MOEs:

- Total Delay (Vehicle-Hours)
- Fuel Consumption (Gallons)

The benefits were calculated for 300 days in a year for eight hours per day (4 hours each for AM and PM peak periods) accounting for reduced benefits anticipated due to lower traffic volumes during the weekend. The value of delay time per hour (\$20.17) and fuel cost (\$4.11) were obtained from "2021 Urban Mobility Report" published by Texas A&M University and "AAA gas prices (as of 4/20/2022)", respectively. **Table 9** summarizes the unit value of each MOE in a tabular format along with its source.

Table 9: Unit Value of MOEs

MOE Values	Unit Value	Source
Delay (\$)	20.17	2021 Urban Mobility Report published by Texas A&M Transportation Institute (TTI)
Fuel (\$/gal.)	\$4.11	AAA Gas Prices (as of 2/3/2022)
Days per Year	300	Average days with observable AM, Mid & PM peaking characteristics

Safety Benefits

Historical crash method as specified in the 2022 FDM was used to calculate the safety benefits of the proposed signal improvements. For this study, safety benefit associated with changing the permissive-only to protected-only left turn phase for the eastbound and westbound left turn movements was used in the B/C analysis. A Crash Reduction Factor (CRF) of 99% was used based on Crash Modification Factor (CMF) ID 333 from the cmfclearinghouse.org for angle crashes. In addition, all the left turn crashes on Madeline Avenue were also assumed to be corrected with the proposed signal improvements.

Improvement Construction Costs

The estimated roadway and signal improvements cost for the Madeline Avenue at Nova Road intersection improvements is \$1,162,410 (2025 value) and it has a corresponding annualized cost amounting to \$85,553. **Table 10** summarizes the cost estimate in today's (2022) dollar value as well for the next three years based on the latest available FDOT highway construction cost inflation factors published on July 1, 2021.

Table 10: Adjusted Cost Estimates based on FDOT Highway Construction Cost Inflation Factors

Fiscal Year	Inflation Factor	Multiplier	Adjusted Cost
2022	Base	1.000	\$1,070,358.98
2023	2.70%	1.027	\$1,099,258.68
2024	2.80%	1.056	\$1,130,299.09
2025	2.90%	1.086	\$1,162,409.86

Table 11 summarizes the benefit cost analysis for the proposed improvements. The analysis yields a B/C ratio of 8.4. The cost estimates can be found in **Appendix F**. Please note that potential right-of-way (ROW) cost is not included in the B/C analysis. The service life for the modification is assumed 20 years and the interest rate used in the calculation of annualized costs is assumed 4%, which is a value frequently used by the FDOT in their benefit cost computations. Based on the conceptual designs of the proposed improvements, it is anticipated that the eastbound approach improvements on Madeline Avenue would not need additional ROW. However, it is anticipated that the westbound approach improvements on Madeline Avenue would need additional ROW of approximately 0.209 acres. Please note that for the eastbound proposed improvements, the north roadway edge was held to minimize ROW impacts.

Conclusion

The calculated B/C ratio indicates that the anticipated benefits outweigh the estimated costs for the proposed modifications, with operational benefits derived through reduced costs associated with lower delay and fuel consumption and safety benefits through costs associated with less crashes.

Table 11: Madeline Avenue at Nova Road - B/C Analysis Results

Proposed Improvements	Total Benefit (Operational + Safety) ^{1,2}	Annualized Construction Cost ³	B/C Ratio ⁴
<ul style="list-style-type: none"> ▪ Extend eastbound left turn lane ▪ Add an exclusive eastbound right turn lane ▪ Extend westbound left turn lane ▪ Add an exclusive westbound right turn lane ▪ Replace permissive-only phase with protected-only phase for the eastbound and westbound left turn movements 	\$720,247	\$85,553	8.4

Notes:

- 1) Operational benefit is based on the year 2025 intersection analysis of the proposed roadway improvements
- 2) Safety benefit is based on the mitigation of angle/left turn crashes from the implementation of protected phase
- 3) Annualized construction cost is based on 2025 values and is based on a total cost of \$1,162,410, interest rate of 4%, and service life of 20 years for the proposed improvements
- 4) ROW cost is not included in the B/C analysis

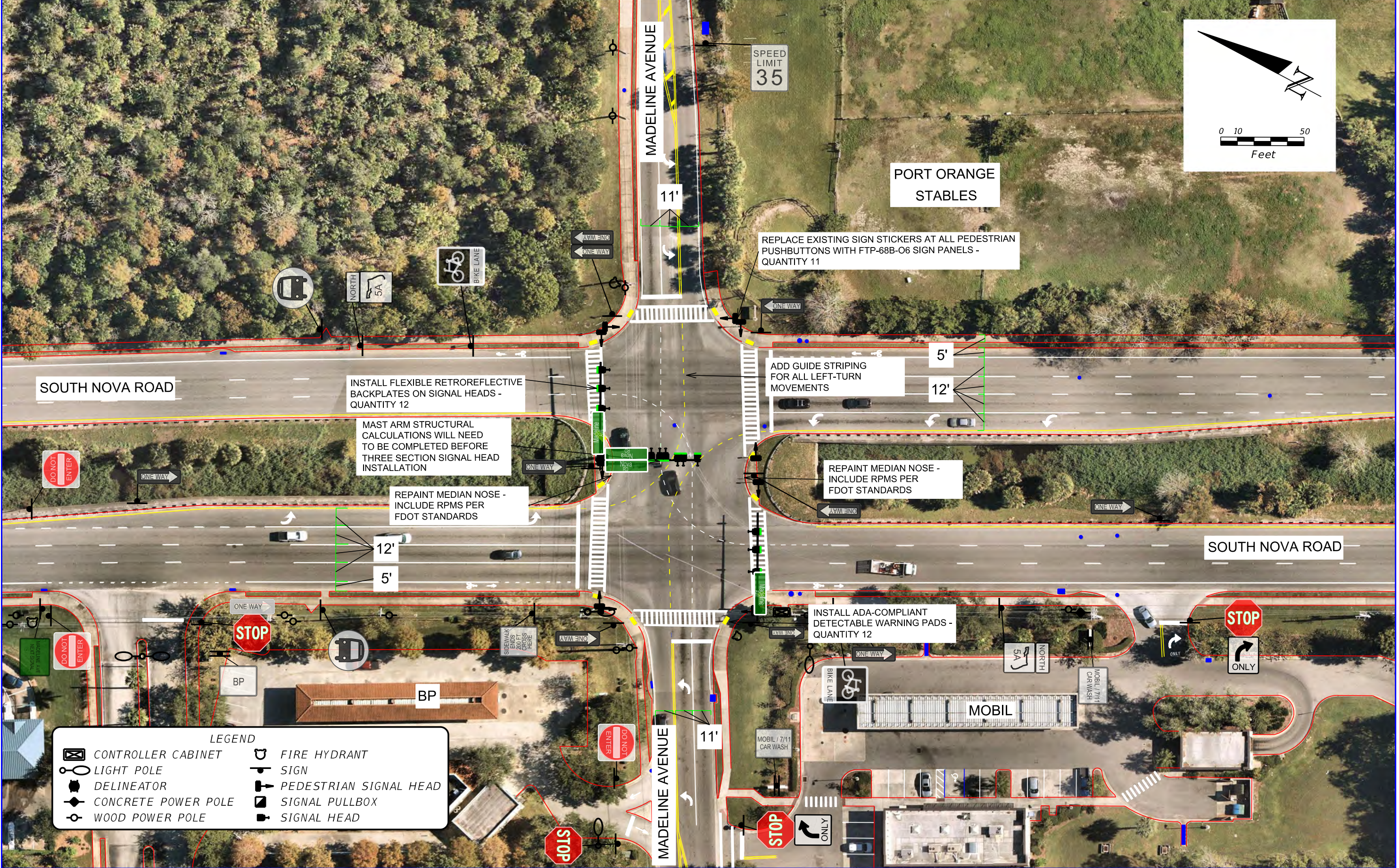
RECOMMENDATIONS

Based upon the crash analysis, qualitative assessment, field observations, intersection analysis, B/C analysis, engineering judgment, and input from FDOT, short-term and long-term improvements are recommended to improve the safety and operation of the study intersection. The short-term improvements are developed in coordination with FDOT and can be constructed as soon as possible. The long-term improvements include the extension of left turn lanes and addition of exclusive right turn lanes on eastbound and westbound Madeline Avenue and other improvements that will be constructed along with these capacity enhancements.

Short-term Recommendations

- Replace the existing permissive-only left turn phase for the eastbound and westbound left turn movements with a protected-only phase. The protected-only left turn phase is recommended because concurrent eastbound and westbound left turn movements cannot be accommodated safely at the study intersection. A separate structural analysis of the existing mast arms must be completed before the installation of three-section signal heads for the eastbound and westbound protected-only left turn phases.
- Increase pedestrian safety with improved lighting (Please note that this recommendation was included in the intersection lighting project (FPID 439881-1) along Nova Road)
- Install flexible retroreflective backplates for all signal heads
- Install ADA-compliant detectable warnings on pedestrian ramps
- Install FTP-68B-06 sign panels to replace sign stickers at pedestrian pushbuttons
- Refresh yellow median nose painting and install reflective pavement markers (RPMs)
- Add guide striping for all the four left turn movements

The short-term considerations are illustrated in **Figure 6**.



REVISIONS				STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION	Short-term Considerations Madeline Ave at Nova Rd		FIGURE NO. 6
DATE	DESCRIPTION	DATE	DESCRIPTION				
				ROAD NO.	COUNTY	FINANCIAL PROJECT ID	
					VOLUSIA		

Long-term Recommendations

- **Extend the existing eastbound left turn lane to a storage length of 295 feet and provide an exclusive right turn lane with a storage length of 220 feet as shown in Figure 7.** Based on the conceptual designs of the proposed improvements, it is anticipated that the eastbound approach improvements on Madeline Avenue would not need additional ROW. Please note that for the eastbound proposed improvements, the northside roadway edge (along Madeline Avenue) was held to minimize right-of-way impacts and the proposed concept strives to provide an efficient design.
- **Extend the existing westbound left turn lane to a storage length of 270 feet and provide an exclusive westbound right turn lane with a storage length of 220 feet as shown in Figure 8.** It is anticipated that the westbound approach improvements on Madeline Avenue would need additional ROW of approximately 0.209 acres.
- Reconstruct traffic signal to meet current FDOT standards
- Install pedestrian detector stations with new pushbuttons to meet ADA criteria for the following:
 - West leg at the northwest and southwest corners
 - East leg at the northeast and southwest corners
 - North leg in both directions in the median
 - South leg at the southeast corner
- Install intersection lighting to meet horizontal and vertical illuminance criteria per current FDOT standards as mandated when reconstructing a signalized intersection

The long-term modifications can be implemented at an approximate construction cost of \$1,162,410 (2025 value) and yields a B/C ratio of 8.4 which indicates that the anticipated benefits outweigh the estimated costs for this recommended alternative.



REVISIONS				VANASSE HANGEN BRUSTLIN, INC. 225 E. ROBINSON STREET ORLANDO, FL 32801	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			Roadway Improvement Diagram Eastbound Madeline Ave at Nova Rd	Figure No.
DATE	DESCRIPTION	DATE	DESCRIPTION		ROAD NO.	COUNTY	FINANCIAL PROJECT ID		7
						VOLUSIA			

\$USERS\$

\$DATES\$

\$TIMES\$

\$MODELNAME\$



REVISIONS				VANASSE HANGEN BRUSTLIN, INC. 225 E. ROBINSON STREET ORLANDO, FL 32801	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			Roadway Improvement Diagram Westbound Madeline Ave at Nova Rd	Figure No.
DATE	DESCRIPTION	DATE	DESCRIPTION		ROAD NO.	COUNTY	FINANCIAL PROJECT ID		8
						VOLUSIA			

APPENDICES

APPENDIX A-1:
Responses to Comments

Feasibility Study for Turn Lane Improvements on Madeline Avenue at Nova Road

Responses to Comments received on the Draft Report submitted in February 2022

Responses to City's Comments

1. Page 3 Paragraph 6 includes the word "eastbound" describing the exclusive right turn lane to be consistent with the description of "westbound" turn lanes in the next paragraph.

Response: *The word "eastbound" will be included in the revised report.*

2. It doesn't seem that anticipated cost to acquire additional ROW was included in the cost estimate and Benefit Cost Analysis.

Response: *As mentioned in the report and based on the approved scope, the anticipated ROW cost is not included in the B/C analysis.*

3. Is any comparison used to determine effectiveness of proposed brick and mortar improvements compared to timing adjustment of lights? Possible east and then west only phases which would allow either side to empty all staging vehicles instead of overlapping? Alternative technology is available that can hold the "dedicated" green arrow for any left turning vehicles staged instead of forcing them to wait until the end of a phase?

Response: *Under the current conditions, the eastbound/westbound left turning vehicles are stopping in the middle of the intersection and then completing the turn at the end of the eastbound/westbound phases because of the permissive-only phases for the side street. As part of this study, a protected phase is recommended to be added to the eastbound/westbound left turn movements to avoid this existing situation. As mentioned in the report, this recommendation is based on field observations as well as crash data. To determine the effectiveness of the capacity and signal improvements, a Build (or After Scenario) analysis was conducted and compared to the No-Build (Before Scenario) and the operational benefits were reported in the Section – 2025 Operational Analysis. Moreover, a B/C analysis was also conducted to quantify the capacity and signal improvement benefits.*

Please note that any modifications to the signal phasing will have to go through FDOT (and adjacent signals along Nova Road will also be considered).

4. They do not allude to the capacity or the current level of Service (LOS) being a percentage of a calculated capacity. Recommendation to improve is being based off of cost benefit and not expansion of the capacity of the intersection.

Response: *Please note that B/C analysis is based on the benefits of the capacity improvements. The benefits of the Build (with the proposed improvements) over the No-Build (existing configuration) are measured by 3 factors - delay, total stops & fuel consumption. Table 11 shows the reduction in delay, number of stops, and fuel consumption in the Build alternative compared to the No-Build alternative.*

5. Page ii – The approximate cost listed doesn't distinguish if it includes design and construction: Text says "modifications can be implemented at an approximate cost"; if just construction costs estimated, suggest changing text to "approximate construction cost"

Response: *The text will be updated to "approximate construction cost".*

6. Page ii – There are 2 items for "consideration"; ADA issues & triangular island. How do we get these included in the design?

Response: *The ADA issues listed in the report will be taken care of as part of the short-term improvements – which most likely will be built by FDOT along with the short-term signal improvements. The long-term ADA considerations will be included in the revised cost estimate. The recommendation related to the triangular island is a consideration (which will have a minor construction cost) that may require coordination with the associated business owner, which is outside the scope of this study. As such, this specific recommendation will not be included in the revised report.*

7. Page 8 – Should the Field Inventory include who is responsible for maintenance?

Response: *We will update the Field Inventory Table to include the roadway maintenance agencies. Based on available information from Volusia County, the roadway maintenance agency for Madeline Ave is the City of Port Orange while FDOT maintains Nova Rd.*

8. Does the study include the existing volume to capacity ratio? If so, please assist in locating this; this is required documentation for the TPO's Implementation Application.

Response: *The existing V/C ratio information is in the Synchro Reports provided in Appendix B. The V/C ratios will be highlighted for easy reference in the updated report.*

9. The Feasibility Study does not appear to inventory, address, or make statements regarding any surrounding infrastructure or stormwater drainage conditions that might be impacted by the improvements.

Response: *Please note that this is a planning level feasibility study, and a field survey was not conducted to make statements regarding the surrounding infrastructure or stormwater drainage conditions that may be impacted by the proposed improvements. However, brief text regarding these impacts will be added to the revised report based on a desktop review of the study location.*

Responses to County's Comments

10. Page ii - Update 1st sentence in last paragraph to show that the project application was submitted by the City, not the County.

Response: *This comment is noted. We will update the report accordingly.*

11. Page 13 - Verify crash info and # for the noted pedestrian/bicycle crash. The crash report seems to indicate the crash involved a southbound vehicle on Nova that struck a cyclist that was crossing diagonally (NE to SW), not an eastbound vehicle on Madeline.

Response: *This comment is noted. We will verify the crash description and update the report accordingly.*

12. Page 29-30 - Clarify which proposed modifications are included in the B/C and project cost estimates. It appears that the signal-related modifications are not included in the cost estimates, but the report combines the signal work and turn lanes in the recommendations. The assumption is that the intent is to implement the signal work together with the turn lane work as part of a single project, but it may be helpful to confirm this and update any language/cost estimates in the study as needed, particularly if any of the signal modifications could potentially require the mast arms to be rebuilt.

Response: *This comment is noted. To clarify, FDOT may be implementing the signal modifications related to changing the permissive left turn phase to protected-only before the construction of the turn lane improvements. As suggested, we will update the LRE to include the cost of all the recommended signal-related modifications and the B/C calculation.*

Responses to FDOT's Comments

13. Include left turn phasing warrants (NCHRP Report 457) in the analysis. Include specific recommendation to install now if left turn phasing is warranted.
- a. Based on the above recommendation, address FYA by time of day and ped-omit phase for the permissive left turn movement during pedestrian actuation.
14. FPID 436325-2 includes ITS communication system and safety improvements at various intersections along SR 5A. The project was scheduled to begin in the Spring of 2021 and end in the Fall of 2022.
15. FPID 439881-1 is an intersection lighting project along SR 5A. SR 5A at Madeline Avenue is included in this project. The goal of this project is to increase pedestrian safety with improved lighting.
16. Short-term Improvements
- a. Install flexible retroreflective backplates for all signal heads.
 - b. Install ADA-compliant detectable warnings on pedestrian ramps.
 - c. Install FTP-68B-06 sign panels to replace sign stickers at pedestrian pushbuttons.
 - d. Install post-mounted R10-15L Left-Turn Yield to Pedestrians signing on the eastbound and westbound approaches
 - e. Refresh yellow median nose painting and install RPMs
 - f. Add guide striping for all four left-turn movements

17. Long-Term Considerations

- a. Install pedestrian detector stations with new pushbuttons to meet ADA criteria for the:
 - i. West leg at the NW and SW corners
 - ii. East leg at the NE and SW corners
 - iii. North leg in both directions in the median
 - iv. South leg at the SE corner
- b. Reconstruct the traffic signal to meet current standards
- c. Install intersection lighting to meet horizontal and vertical illuminance criteria per current FDOT standards as mandated when reconstructing a signalized intersection.

Responses for Comments 13 through 17: These comments are noted. We will update the report accordingly.

APPENDIX A-2:

Traffic Data

Roadway Count Summary

Vanasse Hangen Brustlin, Inc.

Start Date : December 7, 2021
Stop Date : December 7, 2021
County : Volusia

Start Time 00:00
Stop Time 24:00
Station Number 0
Equipment ID 322

Location : Madeline Ave at west of Nova Rd

7-Dec-21

Eastbound Volume

End Time	00	01	02	03	04	05	06	07	08	09	10	11
15	8	4	0	0	1	11	13	54	61	63	63	61
30	4	1	2	2	1	10	27	73	88	65	63	70
45	4	0	1	2	5	15	21	76	66	73	63	84
00	4	3	2	3	2	14	54	78	78	67	63	83
Hr Total	20	8	5	7	9	50	115	281	293	268	252	298

End Time	12	13	14	15	16	17	18	19	20	21	22	23
15	83	73	78	88	83	85	67	56	47	23	18	9
30	89	74	67	96	78	76	65	37	33	19	14	5
45	60	70	81	95	95	83	61	46	35	16	13	8
00	86	88	77	109	90	64	53	38	27	13	12	5
Hr Total	318	305	303	388	346	308	246	177	142	71	57	27

24 Hour Total : 4,294
AM Peak Hour begins : 11:30
PM Peak Hour begins : 15:00

AM Peak Volume : 339
PM Peak Volume : 388
AM Peak Hour Factor : 0.95
PM Peak Hour Factor : 0.89

7-Dec-21

Westbound Volume

End Time	00	01	02	03	04	05	06	07	08	09	10	11
15	7	5	4	2	4	12	19	42	90	67	76	69
30	4	3	3	4	2	15	21	53	63	66	72	54
45	4	1	1	3	6	12	38	73	64	65	59	61
00	5	3	0	3	4	12	44	87	54	58	62	70
Hr Total	20	12	8	12	16	51	122	255	271	256	269	254

End Time	12	13	14	15	16	17	18	19	20	21	22	23
15	83	82	82	67	99	110	93	55	31	36	20	13
30	83	89	97	104	107	127	66	44	42	16	15	7
45	100	60	81	130	118	71	50	31	42	26	10	10
00	77	68	109	93	117	69	42	37	22	24	8	4
Hr Total	343	299	369	394	441	377	251	167	137	102	53	34

24 Hour Total : 4,513
AM Peak Hour begins : 11:45
PM Peak Hour begins : 16:30

AM Peak Volume : 336
PM Peak Volume : 472
AM Peak Hour Factor : 0.84
PM Peak Hour Factor : 0.93

7-Dec-21

Total Volume for All Lanes

End Time	00	01	02	03	04	05	06	07	08	09	10	11
15	15	9	4	2	5	23	32	96	151	130	139	130
30	8	4	5	6	3	25	48	126	151	131	135	124
45	8	1	2	5	11	27	59	149	130	138	122	145
00	9	6	2	6	6	26	98	165	132	125	125	153
Hr Total	40	20	13	19	25	101	237	536	564	524	521	552

End Time	12	13	14	15	16	17	18	19	20	21	22	23
15	166	155	160	155	182	195	160	111	78	59	38	22
30	172	163	164	200	185	203	131	81	75	35	29	12
45	160	130	162	225	213	154	111	77	77	42	23	18
00	163	156	186	202	207	133	95	75	49	37	20	9
Hr Total	661	604	672	782	787	685	497	344	279	173	110	61

24 Hour Total : 8,807
AM Peak Hour begins : 11:45
PM Peak Hour begins : 16:30

AM Peak Volume : 651
PM Peak Volume : 818
AM Peak Hour Factor : 0.95
PM Peak Hour Factor : 0.96

Roadway Count Summary

Vanasse Hangen Brustlin, Inc.

Start Date : December 7, 2021
Stop Date : December 7, 2021
County : Volusia

Start Time 00:00
Stop Time 24:00
Station Number 0
Equipment ID 9

Location : Nova Rd south of Madeline Ave

7-Dec-21

Northbound Volume

End Time	00	01	02	03	04	05	06	07	08	09	10	11
15	23	17	10	11	7	27	71	145	218	209	212	244
30	20	12	5	7	20	34	64	216	208	221	237	217
45	12	5	8	6	21	37	135	302	243	245	256	206
00	10	10	9	4	22	54	141	309	221	230	246	260
Hr Total	65	44	32	28	70	152	411	972	890	905	951	927

End Time	12	13	14	15	16	17	18	19	20	21	22	23
15	262	261	240	251	296	309	223	163	112	92	62	44
30	222	240	285	257	287	265	242	111	111	62	45	36
45	262	283	271	271	294	262	192	132	82	62	48	32
00	231	267	247	280	291	242	139	122	96	65	30	22
Hr Total	977	1,051	1,043	1,059	1,168	1,078	796	528	401	281	185	134

24 Hour Total : 14,148
AM Peak Hour begins : 7:15
PM Peak Hour begins : 16:15

AM Peak Volume : 1,045
PM Peak Volume : 1,181
AM Peak Hour Factor : 0.85
PM Peak Hour Factor : 0.96

7-Dec-21

Lane 2

End Time	00	01	02	03	04	05	06	07	08	09	10	11
15	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0
00	0	0	0	0	0	0	0	0	0	0	0	0
Hr Total	0	0	0	0	0	0	0	0	0	0	0	0

End Time	12	13	14	15	16	17	18	19	20	21	22	23
15	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0
00	0	0	0	0	0	0	0	0	0	0	0	0
Hr Total	0	0	0	0	0	0	0	0	0	0	0	0

24 Hour Total : 0
AM Peak Hour begins :
PM Peak Hour begins :

AM Peak Volume : 0
PM Peak Volume : 0
AM Peak Hour Factor :
PM Peak Hour Factor :

7-Dec-21

Total Volume for All Lanes

End Time	00	01	02	03	04	05	06	07	08	09	10	11
15	23	17	10	11	7	27	71	145	218	209	212	244
30	20	12	5	7	20	34	64	216	208	221	237	217
45	12	5	8	6	21	37	135	302	243	245	256	206
00	10	10	9	4	22	54	141	309	221	230	246	260
Hr Total	65	44	32	28	70	152	411	972	890	905	951	927

End Time	12	13	14	15	16	17	18	19	20	21	22	23
15	262	261	240	251	296	309	223	163	112	92	62	44
30	222	240	285	257	287	265	242	111	111	62	45	36
45	262	283	271	271	294	262	192	132	82	62	48	32
00	231	267	247	280	291	242	139	122	96	65	30	22
Hr Total	977	1,051	1,043	1,059	1,168	1,078	796	528	401	281	185	134

24 Hour Total : 14,148
AM Peak Hour begins : 7:15
PM Peak Hour begins : 16:15

AM Peak Volume : 1,045
PM Peak Volume : 1,181
AM Peak Hour Factor : 0.85
PM Peak Hour Factor : 0.96

SECTION:63308.06

STATE ROUTE:Nova Rd.

OBSERVER:VHB

WEATHER:Good

CITY:Port Orange

INTERSECTING ROUTE:Madeline Ave

DATE OF COUNT:12/7/21

ROAD CONDITION:Good

COUNT PERIODS:

COUNTY:Volusia

MILEPOST:0.000

COMPLETED BY:VHB

DATE COMPLETED:12/7/21

VEHICLE TURNING MOVEMENT COUNT

ALL VEHICLES / ALL MOVEMENTS

Direction	Northbound						Southbound							Eastbound						Westbound							
Start Time	NBU	NBL	NBT	NBR	NBRTOR	Total	SBU	SBL	SBT	SBR	SBRTOR	Total	NS Total	EBU	EBL	EBT	EBR	EBRTOR	Total	WBU	WBL	WBT	WBR	WBRTOR	Total	EW Total	Grand Total
7:00 AM	0	12	129	3	0	144	1	5	112	8	2	128	272	0	10	20	17	11	58	0	8	17	7	1	33	91	363
7:15 AM	2	16	181	8	1	208	2	13	184	7	3	209	417	0	17	35	24	3	79	0	9	26	18	5	58	137	554
7:30 AM	3	18	266	9	0	296	5	10	177	15	1	208	504	0	14	28	19	12	73	0	15	39	24	8	86	159	663
7:45 AM	4	25	262	1	0	292	0	5	216	12	6	239	531	0	22	26	25	8	81	0	18	43	28	2	91	172	703
Total	9	71	838	21	1	940	8	33	689	42	12	784	1,724	0	63	109	85	34	291	0	50	125	77	16	268	559	2,283
8:00 AM	1	21	194	3	1	220	2	7	204	20	8	241	461	0	25	12	25	6	68	0	11	33	18	2	64	132	593
8:15 AM	5	21	173	8	4	211	4	2	206	17	2	231	442	0	23	18	37	11	89	0	10	18	9	3	40	129	571
8:30 AM	4	19	204	6	0	233	5	7	189	12	7	220	453	0	12	17	23	17	69	0	15	23	8	7	53	122	575
8:45 AM	9	14	192	5	0	220	3	6	213	14	3	239	459	0	16	18	35	8	77	0	12	21	11	1	45	122	581
Total	19	75	763	22	5	884	14	22	812	63	20	931	1,815	0	76	65	120	42	303	0	48	95	46	13	202	505	2,320
11:00 AM	7	30	183	14	2	236	5	3	152	11	2	173	409	0	15	23	27	3	68	0	12	16	10	0	38	106	515
11:15 AM	2	16	196	11	0	225	3	4	232	17	6	262	487	0	16	21	12	8	57	0	6	15	6	1	28	85	572
11:30 AM	3	30	158	8	1	200	4	3	211	16	8	242	442	0	24	20	34	12	90	0	7	12	8	2	29	119	561
11:45 AM	5	28	212	10	1	256	7	4	240	18	9	278	534	1	25	25	14	18	83	0	8	14	3	2	27	110	644
Total	17	104	749	43	4	917	19	14	835	62	25	955	1,872	1	80	89	87	41	298	0	33	57	27	5	122	420	2,292
12:00 PM	6	28	221	7	0	262	5	5	220	19	7	256	518	0	25	22	28	9	84	0	16	30	7	1	54	138	656
12:15 PM	5	28	180	6	0	219	9	10	222	26	1	268	487	0	23	20	33	15	91	0	6	25	13	1	45	136	623
12:30 PM	3	34	216	6	1	260	10	5	205	30	9	259	519	0	17	14	17	11	59	0	8	20	6	0	34	93	612
12:45 PM	3	29	194	5	0	231	10	6	253	22	3	294	525	0	28	31	26	6	91	0	6	21	8	2	37	128	653
Total	17	119	811	24	1	972	34	26	900	97	20	1,077	2,049	0	93	87	104	41	325	0	36	96	34	4	170	495	2,544
2:00 PM	3	28	183	10	1	225	4	13	240	26	11	294	519	0	16	33	36	0	85	0	9	14	9	5	37	122	641
2:15 PM	5	37	229	5	1	277	5	10	222	24	3	264	541	0	16	21	30	9	76	0	12	26	6	2	46	122	663
2:30 PM	2	24	222	6	0	254	6	12	250	18	11	297	551	0	19	25	26	6	76	0	12	27	19	1	59	135	686
2:45 PM	6	33	181	11	0	231	11	11	223	26	10	281	512	0	29	36	23	7	95	0	5	39	19	0	63	158	670
Total	16	122	815	32	2	987	26	46	935	94	35	1,136	2,123	0	80	115	115	22	332	0	38	106	53	8	205	537	2,660
3:00 PM	3	25	212	11	0	251	7	4	240	27	5	283	534	0	26	19	36	2	83	0	4	19	10	5	38	121	655
3:15 PM	3	30	208	6	0	247	3	19	251	29	6	308	555	0	20	33	41	4	98	0	11	30	13	1	55	153	708
3:30 PM	2	39	215	9	0	265	7	16	252	36	17	328	593	1	35	18	44	4	102	1	9	30	10	5	55	157	750
3:45 PM	6	27	222	11	0	266	4	12	322	43	4	385	651	2	24	36	43	5	110	0	9	17	7	7	40	150	801
Total	14	121	857	37	0	1,029	21	51	1,065	135	32	1,304	2,333	3	105	106	164	15	393	1	33	96	40	18	188	581	2,914
4:00 PM	6	40	229	14	1	290	2	11	212	24	5	254	544	0	27	27	32	10	96	0	16	22	9	2	49	145	689
4:15 PM	0	47	246	10	1	304	11	13	249	27	10	310	614	0	15	29	20	11	75	0	4	25	9	1	39	114	728
4:30 PM	8	40	236	11	2	297	5	14	280	27	7	333	630	0	29	34	33	5	101	0	9	29	10	0	48	149	779
4:45 PM	5	52	226	8	2	293	4	9	275	26	3	317	610	0	20	41	34	9	104	0	7	20	18	1	46	150	760
Total	19	179	937	43	6	1,184	22	47	1,016	104	25	1,214	2,398	0	91	131	119	35	376	0	36	96	46	4	182	558	2,956
5:00 PM	2	45	242	12	0	301	5	7	317	33	5	367	668	0	19	25	29	10	83	0	9	22	8	2	41	124	792
5:15 PM	6	34	200	7	0	247	4	22	326	39	5	396	643	0	18	34	34	3	89	0	5	44	7	2	58	147	790
5:30 PM	3	24	232	13	0	272	4	10	296	15	5	330	602	0	23	28	29	7	87	0	11	22	8	3	44	131	733
5:45 PM	3	23	181	12	2	221	4	7	289	15	8	323	544	0	17	30	20	3	70	0	13	17	8	1	39	109	653
Total	14	126	855	44	2	1,041	17	46	1,228	102	23	1,416	2,457	0	77	117	112	23	329	0	38	105	31	8	182	511	2,968

SECTION:

63308.06

CITY:

Port Orange

COUNTY:

Volusia

STATE ROUTE:

Nova Rd.

INTERSECTING ROUTE:

Madeline Ave

MILEPOST:

0.000

OBSERVER:

VHB

DATE OF COUNT:

12/7/21

COMPLETED BY:

VHB

WEATHER:

Good

ROAD CONDITION:

Good

DATE COMPLETED:

12/7/21

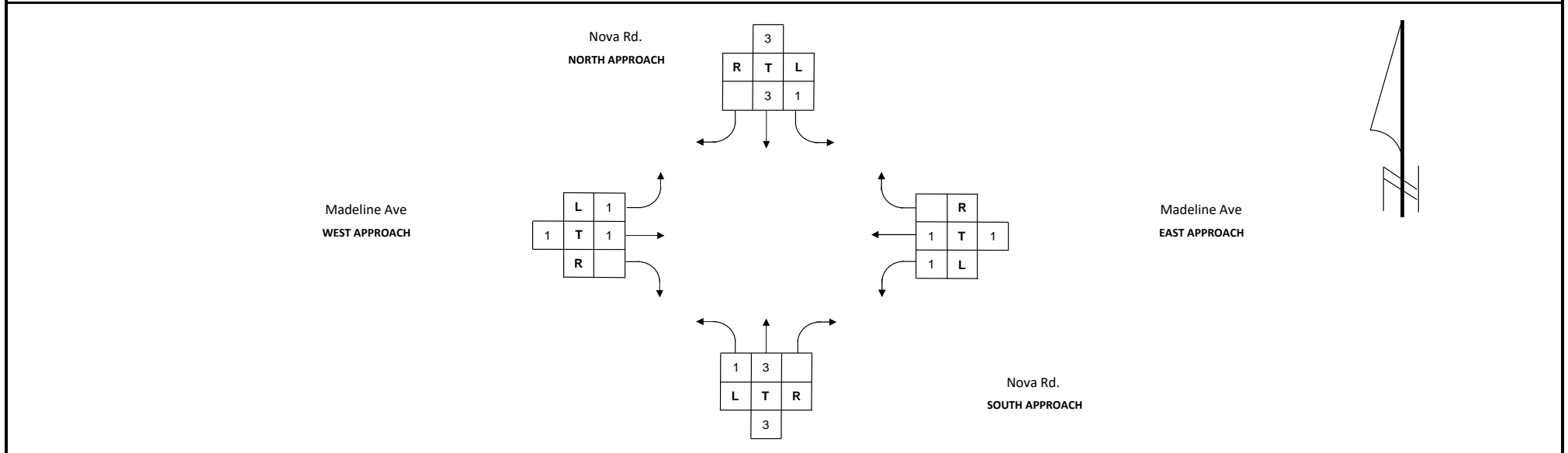
COUNT PERIODS:

HEAVY VEHICLES (TRUCKS + BUSES)

Direction	Northbound						Southbound						NS Total	Eastbound						Westbound						EW Total	Grand Total
Start Time	NBU	NBL	NBT	NBR	NBRTOR	Total	SBU	SBL	SBT	SBR	SBRTOR	Total		EBU	EBL	EBT	EBR	EBRTOR	Total	WBU	WBL	WBT	WBR	WBRTOR	Total		
7:00 AM	0	1	1	1	0	3	0	0	6	0	0	6	9	0	0	0	0	1	1	0	0	0	0	0	10		
7:15 AM	0	0	3	0	0	3	0	1	5	1	0	7	10	0	0	0	0	0	0	0	1	0	0	1	11		
7:30 AM	0	0	2	0	0	2	0	0	4	0	0	4	6	0	0	1	0	0	1	0	0	2	2	0	4	5	11
7:45 AM	0	0	3	0	0	3	0	0	7	0	0	7	10	0	0	0	0	0	0	0	0	0	0	0	0	10	
Total	0	1	9	1	0	11	0	1	22	1	0	24	35	0	0	1	0	1	2	0	1	2	2	0	5	7	42
8:00 AM	0	0	4	0	0	4	0	0	10	0	1	11	15	0	1	0	0	0	1	0	0	0	0	0	1	16	
8:15 AM	0	0	5	0	0	5	0	0	4	0	0	4	9	0	0	0	0	0	0	0	0	1	0	0	1	1	10
8:30 AM	0	0	6	0	0	6	0	0	12	0	0	12	18	0	2	0	0	0	2	0	0	1	0	0	1	3	21
8:45 AM	0	1	6	0	0	7	0	0	7	1	0	8	15	0	0	0	0	0	0	0	0	0	0	0	0	0	15
Total	0	1	21	0	0	22	0	0	33	1	1	35	57	0	3	0	0	0	3	0	0	2	0	0	2	5	62
11:00 AM	1	0	5	1	0	7	0	0	7	0	0	7	14	0	0	2	1	0	3	0	1	0	0	0	1	4	18
11:15 AM	0	0	8	1	0	9	0	0	2	0	1	3	12	0	0	2	0	1	3	0	0	0	0	0	0	3	15
11:30 AM	0	1	3	1	0	5	0	0	7	0	0	7	12	0	1	0	1	0	2	0	1	0	0	0	1	3	15
11:45 AM	0	0	6	0	0	6	0	0	4	0	0	4	10	0	0	0	0	0	0	0	1	0	0	0	1	1	11
Total	1	1	22	3	0	27	0	0	20	0	1	21	48	0	1	4	2	1	8	0	3	0	0	0	3	11	59
12:00 PM	1	0	2	0	0	3	1	0	8	0	0	9	12	0	1	0	0	0	1	0	0	0	0	0	0	1	13
12:15 PM	0	0	4	0	0	4	0	0	5	1	0	6	10	0	0	0	0	0	0	0	0	1	0	0	1	1	11
12:30 PM	0	1	7	0	0	8	0	0	3	0	0	3	11	0	1	0	0	0	1	0	0	0	0	0	0	1	12
12:45 PM	0	0	6	0	0	6	0	0	6	2	0	8	14	0	0	1	0	0	1	0	0	1	0	0	1	2	16
Total	1	1	19	0	0	21	1	0	22	3	0	26	47	0	2	1	0	0	3	0	0	2	0	0	2	5	52
2:00 PM	0	0	1	0	0	1	0	0	8	0	1	9	10	0	2	4	1	0	7	0	0	0	0	0	0	7	17
2:15 PM	0	3	5	0	0	8	1	0	5	0	0	6	14	0	0	0	1	0	1	0	0	1	0	0	1	2	16
2:30 PM	0	0	3	1	0	4	0	0	7	2	0	9	13	0	0	0	0	0	0	0	2	2	0	0	4	4	17
2:45 PM	0	1	5	0	0	6	0	0	3	0	0	3	9	0	0	3	0	0	3	0	0	1	0	0	1	4	13
Total	0	4	14	1	0	19	1	0	23	2	1	27	46	0	2	7	2	0	11	0	2	4	0	0	6	17	63
3:00 PM	0	0	4	0	0	4	0	0	4	1	0	5	9	0	0	0	2	0	2	0	0	0	0	0	0	2	11
3:15 PM	0	0	7	0	0	7	0	1	6	0	0	7	14	0	0	0	0	0	0	0	0	0	0	0	0	0	14
3:30 PM	0	0	8	0	0	8	0	0	5	3	0	8	16	0	0	1	1	0	2	0	0	0	0	0	0	2	18
3:45 PM	0	0	4	0	0	4	0	0	5	1	0	6	10	0	0	0	0	0	0	0	0	1	0	0	1	1	11
Total	0	0	23	0	0	23	0	1	20	5	0	26	49	0	0	1	3	0	4	0	0	1	0	0	1	5	54
4:00 PM	0	0	4	1	0	5	0	0	3	0	0	3	8	0	1	2	1	0	4	0	0	1	0	0	1	5	13
4:15 PM	0	1	4	0	0	5	1	0	4	0	1	6	11	0	0	0	0	0	0	0	0	0	0	0	0	0	11
4:30 PM	0	2	6	0	0	8	0	1	3	0	1	5	13	0	1	0	0	1	2	0	0	1	1	0	2	4	17
4:45 PM	0	0	2	0	0	2	0	0	4	0	0	4	6	0	1	0	1	0	2	0	0	0	0	0	0	2	8
Total	0	3	16	1	0	20	1	1	14	0	2	18	38	0	3	2	2	1	8	0	0	2	1	0	3	11	49
5:00 PM	0	0	2	0	0	2	0	0	3	2	0	5	7	0	2	0	0	0	2	0	0	1	0	0	1	3	10
5:15 PM	0	0	5	0	0	5	0	0	2	0	0	2	7	0	0	0	1	0	1	0	0	0	0	0	0	1	8
5:30 PM	0	1	2	0	0	3	0	0	4	0	0	4	7	0	0	1	0	0	1	0	0	0	0	0	0	1	8
5:45 PM	0	0	2	0	0	2	0	0	1	0	0	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Total	0	1	11	0	0	12	0	0	10	2	0	12	24	0	2	1	1	0	4	0	0	1	0	0	1	5	29

FLORIDA DEPARTMENT OF TRANSPORTATION SUMMARY OF VEHICLE MOVEMENTS

SECTION:	63308.06	CITY:	Port Orange	COUNTY:	Volusia
STATE ROUTE:	Nova Rd.	INTERSECTING ROUTE:	Madeline Ave	MILEPOST:	0.000
OBSERVER:	VHB	DATE:	12/7/21	COMPLETED BY:	VHB
WEATHER:	Good	ROAD CONDITION:	Good	DATE COMPLETED:	1/0/00
REMARKS:					



TIME	NORTHBOUND						SOUTHBOUND						TOTAL	EASTBOUND						WESTBOUND						TOTAL
BEGIN/END	U	L	T	R	RTOR	TOT	U	L	T	R	RTOR	TOT	N/S	U	L	T	R	RTOR	TOT	U	L	T	R	RTOR	TOT	E/W
7:00 - 8:00	9	71	838	21	1	940	8	33	689	42	12	784	1,724	0	63	109	85	34	291	0	50	125	77	16	268	559
8:00 - 9:00	19	75	763	22	5	884	14	22	812	63	20	931	1,815	0	76	65	120	42	303	0	48	95	46	13	202	505
11:00 - 12:00	17	104	749	43	4	917	19	14	835	62	25	955	1,872	1	80	89	87	41	298	0	33	57	27	5	122	420
12:00 - 13:00	17	119	811	24	1	972	34	26	900	97	20	1,077	2,049	0	93	87	104	41	325	0	36	96	34	4	170	495
14:00 - 15:00	16	122	815	32	2	987	26	46	935	94	35	1,136	2,123	0	80	115	115	22	332	0	38	106	53	8	205	537
15:00 - 16:00	14	121	857	37	0	1,029	21	51	1,065	135	32	1,304	2,333	3	105	106	164	15	393	1	33	96	40	18	188	581
16:00 - 17:00	19	179	937	43	6	1,184	22	47	1,016	104	25	1,214	2,398	0	91	131	119	35	376	0	36	96	46	4	182	558
17:00 - 18:00	14	126	855	44	2	1,041	17	46	1,228	102	23	1,416	2,457	0	77	117	112	23	329	0	38	105	31	8	182	511
TOTAL	125	917	6,625	266	21	7,954	161	285	7,480	699	192	8,817	16,771	4	665	819	906	253	2,647	1	312	776	354	76	1,519	4,166

Percentage	1.6%	11.5%	83.3%	3.3%	0.3%	100.0%	1.8%	3.2%	84.8%	7.9%	2.2%	100.0%	N/A	0.2%	25.1%	30.9%	34.2%	9.6%	100.0%	0.1%	20.5%	51.1%	23.3%	5.0%	100.0%	N/A
Maximum	19	179	937	44	6	1,184	34	51	1,228	135	35	1,416	2,457	3	105	131	164	42	393	1	50	125	77	18	268	581
Minimum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Heavy Veh	23		199	10	1	233	9		249	16	6	280	513	17		22	22	3	64	9		17	4	0	30	94
% Heavy Veh	2.2%		3.0%	3.8%		2.9%	2.0%		3.3%	2.5%		3.2%	3.1%	2.5%		2.7%	2.2%		2.4%	2.9%		2.2%	0.9%		2.0%	2.3%

SECTION	63308.06
STATE ROUTE	Nova Rd.
OBSERVER	VHB
COUNTY	Volusia
MILEPOST	0.000
COUNT HOURS	

CITY	Port Orange
INTERSECTING ROUTE	Madeline Ave
DATE OF COUNT	12/7/21
WEATHER	Good
COMPLETED BY	VHB
DATE	1/0/00

0-1	0	0	0
1-2	0	0	0
2-3	0	0	0
3-4	0	0	0
4-5	0	0	0
5-6	0	0	0
6-7	0	0	0
7-8	0	0	0
8-9	0	1	1
9-10	0	0	0
10-11	0	0	0
11-12	0	0	0
12-13	0	0	0
13-14	0	0	0
14-15	0	0	0
15-16	0	0	0
16-17	0	0	0
17-18	0	0	0
18-19	0	0	0
19-20	0	0	0
20-21	0	0	0
21-22	0	0	0
22-23	0	0	0
23-24	0	0	0
Total	0	1	1

Nova Rd.
SOUTH APPROACH

WEST APPROACH
Madeline Ave

**Madeline Ave
EAST APPROACH**

0-1	0	0	0
1-2	0	0	0
2-3	0	0	0
3-4	0	0	0
4-5	0	0	0
5-6	0	0	0
6-7	0	0	0
7-8	0	0	0
8-9	0	0	0
9-10	0	0	0
10-11	0	2	2
11-12	0	0	0
12-13	0	0	0
13-14	0	0	0
14-15	0	0	0
15-16	0	0	0
16-17	0	0	0
17-18	0	0	0
18-19	0	0	0
19-20	0	0	0
20-21	0	0	0
21-22	0	0	0
22-23	0	0	0
23-24	0	0	0
Total	0	2	2

[illegible]

SECTION	63308.06
STATE ROUTE	Nova Rd.
OBSERVER	VHB
COUNTY	Volusia
MILEPOST	0.000
COUNT HOURS	

CITY	Port Orange
INTERSECTING ROUTE	Madeline Ave
DATE OF COUNT	12/7/21
WEATHER	Good
COMPLETED BY	VHB
DATE	1/0/00

	12-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	Total
0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	4	0	0	0	0	0	0	0	6
0	0	0	0	0	0	0	0	2	0	1	0	0	0	1	0	4	0	0	0	0	0	0	0	0	8

0-1	0	0	0
1-2	0	0	0
2-3	0	0	0
3-4	0	0	0
4-5	0	0	0
5-6	0	0	0
6-7	0	0	0
7-8	0	0	0
8-9	0	0	0
9-10	0	0	0
10-11	1	0	1
11-12	0	0	0
12-13	0	0	0
13-14	0	1	1
14-15	0	0	0
15-16	0	0	0
16-17	0	0	0
17-18	1	0	1
18-19	0	0	0
19-20	0	0	0
20-21	0	0	0
21-22	0	0	0
22-23	0	0	0
23-24	0	0	0
Total	2	1	3

Nova Rd.
SOUTH APPROACH

WEST APPROACH
Madeline Ave

**Madeline Ave
EAST APPROACH**

0-1	0	0	0
1-2	0	0	0
2-3	0	0	0
3-4	0	0	0
4-5	0	0	0
5-6	0	0	0
6-7	0	0	0
7-8	0	0	0
8-9	0	0	0
9-10	0	0	0
10-11	0	0	0
11-12	0	0	0
12-13	0	0	0
13-14	0	0	0
14-15	0	0	0
15-16	0	0	0
16-17	0	0	0
17-18	0	0	0
18-19	0	0	0
19-20	0	0	0
20-21	0	0	0
21-22	0	0	0
22-23	0	0	0
23-24	0	0	0
Total	0	0	0

[illegible]

APPENDIX B:

**Existing Synchro Outputs
And
Signal Timing Sheets
And
Left Turn Phase Warrants**

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION
TSM&O Continuing Services Contract
Volusia County 2017
FM: 440412-1-32-01



SR 5A at Madeline Avenue (153) Prepared By: FDA Date: 12/14/2017
North-South Roadway SR 5A East-West Roadway Madeline Avenue

PHASE TIMES								
PHASE	1	2	3	4	5	6	7	8
DIRECTION	NBL	SB		WB	SBL	NB		EB
LEFT TURN	Prot	Prot		Perm	Prot	Prot		Perm
MIN GRN	7	16		11	7	16		11
GAP EXT	3.0	4.0		4.0	3.0	4.0		4.0
YEL CLR	5.1	5.1		4.0	5.1	5.1		4.0
RED CLR	3.5	2.0		4.5	3.5	2.0		4.5
MAX 1	25	45		30	25	45		30
MAX 2								
DYM MAX		90				90		
DYM STEP		10				10		
WALK		10		10		10		10
PED CLR		15		18		14		19
RECALL		MIN				MIN		
DETECTOR	LOCK	LOCK		NON-LOCK	LOCK	LOCK		NON-LOCK
FLASH	RED	YELLOW		RED	RED	YELLOW		RED
SET		2				2		
CLEAR		2				2		

Weekday (Monday-Friday) Day 1	TIME BASE COORDINATION				COORDINATION PATTERN TABLES			
	Plan	Start	End	Pattern	Cycle Length	Offset	Coord Phase	Sequence
	Existing	0:00	7:00	11	Free			
	AM	7:00	10:00	1	150	85	2, 6	2
	Midday	10:00	14:00	2	140	80	2, 6	2
	PM	14:00	19:00	3	160	153	2, 6	2
Weekend (Saturday) Day 2	Existing	19:00	0:00	11	Free			
	TIME BASE COORDINATION				COORDINATION PATTERN TABLES			
	Plan	Start	End	Pattern	Cycle Length	Offset	Coord Phase	Sequence
	Existing	0:00	10:00	11	Free			
	Midday	10:00	19:00	2	140	80	2, 6	2
	Existing	19:00	0:00	11	Free			
Weekend (Sunday) Day 3	TIME BASE COORDINATION				COORDINATION PATTERN TABLES			
	Plan	Start	End	Pattern	Cycle Length	Offset	Coord Phase	Sequence
	Existing	0:00	11:00	11	Free			
	Midday	11:00	18:00	2	140	80	2, 6	2
	Existing	18:00	0:00	11	Free			

COORDINATION SPLIT TABLES								
Pattern 1								
Phase	1	2	3	4	5	6	7	8
Time (sec)	25	83		42	25	83		42
Recall								
Pattern 2								
Phase	1	2	3	4	5	6	7	8
Time (sec)	25	80		35	20	85		35
Recall								
Pattern 3								
Phase	1	2	3	4	5	6	7	8
Time (sec)	30	80		50	25	85		50
Recall								

CONTROLLER TYPE		CONDITION OF OVERHEAD		PROM NUMBER	SIGNAL OWNER
		OVERHEAD STREET NAMES			
PHASES:		ILLUMINATED STREET NAMES			
CABINET TYPE		PRE-EMPTION		IP ADDRESS	LED
CABINET DATE		PRE-EMPTION TYPE			

NOTES

1. Offset Reference: Yellow
2. Force-off: Fixed
3. Maximum Select: Inhibit Max
4. Use Ped Time: No
5. Sequence 2: Reverse Phases 1 and 2
6. Dual entry phases 4 and 8

1	2	4
5	6	8























Approach	EB	WB	NB	SB
Crosswalk Length (ft)	34.0	34.1	121.9	122.0
Crosswalk Width (ft)	12.0	12.0	12.0	12.0
Total Number of Lanes Crossed	3	3	7	7
Number of Right-Turn Islands	0	0	0	0
Type of Control	Actuated	Actuated	Actuated	Actuated
Corresponding Signal Phase	2	6	8	4
Effective Walk Time (s)	14.0	14.0	14.0	14.0
Right Corner Size A (ft)	9.0	9.0	9.0	9.0
Right Corner Size B (ft)	9.0	9.0	9.0	9.0
Right Corner Curb Radius (ft)	0.0	0.0	0.0	0.0
Right Corner Total Area (sq.ft)	81.00	81.00	81.00	81.00
Ped. Left-Right Flow Rate (p/h)	0	0	0	0
Ped. Right-Left Flow Rate (p/h)	0	0	0	0
Ped. R. Sidewalk Flow Rate (p/h)	0	0	0	0
Veh. Perm. L. Flow in Walk (v/h)	104	48	54	100
Veh. Perm. R. Flow in Walk (v/h)	88	27	143	113
Veh. RTOR Flow in Walk (v/h)	0	0	0	0
85th percentile speed (mph)	35	35	50	50
Right Corner Area per Ped (sq.ft)	0.0	0.0	0.0	0.0
Right Corner Quality of Service	-	-	-	-
Ped. Circulation Area (sq.ft)	0.0	0.0	0.0	0.0
Crosswalk Circulation Code	-	-	-	-
Pedestrian Delay (s/p)	61.7	61.7	61.7	61.7
Pedestrian Compliance Code	Poor	Poor	Poor	Poor
Pedestrian Crosswalk Score	2.39	2.22	3.29	3.36
Pedestrian Crosswalk LOS	B	B	C	C

Approach	EB	WB	NB	SB
Bicycle Flow Rate (bike/h)	0	0	0	0
Total Flow Rate (veh/h)	363	334	1360	1138
Effct. Green for Bike (s)	35.0	35.0	84.0	75.9
Cross Street Width (ft)	121.9	122.0	34.1	34.0
Through Lanes Number	1	1	3	3
Through Lane Width (ft)	11.0	11.0	12.0	12.0
Bicycle Lane Width (ft)	0.0	0.0	5.0	5.0
Striped Parking Lane Width (ft)	0.0	0.0	0.0	0.0
Paved Shoulder Width (ft)	3.0	3.0	0.0	0.0
Curb Is Present?	No	No	No	No
On Street Parking?	No	No	No	No
Bicycle Lane Capacity (bike/h)	467	467	1120	1012
Bicycle Delay (s/bike)	44.1	44.1	14.5	18.3
Bicycle Compliance	Poor	Poor	Fair	Fair
Bicycle LOS Score	3.59	3.55	1.76	1.63
Bicycle LOS	D	D	B	B

Lanes and Geometrics

3: Nova Rd & Madeline Ave

Existing AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	84	143	54	133	113	104	1093	27	48	888	88
Future Volume (vph)	100	84	143	54	133	113	104	1093	27	48	888	88
Satd. Flow (prot)	1728	1656	0	1745	1676	0	1805	5067	0	1805	4974	0
Flt Permitted	0.367			0.410			0.950			0.950		
Satd. Flow (perm)	667	1656	0	753	1676	0	1805	5067	0	1805	4974	0
Satd. Flow (RTOR)		53			26			3			16	
Lane Group Flow (vph)	111	252	0	60	274	0	116	1244	0	53	1085	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8			4								
Total Split (s)	42.0	42.0		42.0	42.0		25.0	83.0		25.0	83.0	
Total Lost Time (s)	11.5	8.5		11.5	8.5		8.6	7.1		8.6	7.1	
Act Effect Green (s)	32.0	35.0		32.0	35.0		14.9	84.0		10.0	75.9	
Actuated g/C Ratio	0.21	0.23		0.21	0.23		0.10	0.56		0.07	0.51	
v/c Ratio	0.78	0.59		0.38	0.67		0.65	0.44		0.45	0.43	
Control Delay	88.2	44.3		54.4	54.0		81.1	22.3		78.3	25.5	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	88.2	44.3		54.4	54.0		81.1	22.3		78.3	25.5	
LOS	F	D		D	D		F	C		E	C	
Approach Delay		57.8			54.1			27.3			28.0	
Approach LOS		E			D			C			C	

Intersection Summary

Cycle Length: 150

Actuated Cycle Length: 150

Offset: 85 (57%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.78

Intersection Signal Delay: 33.8

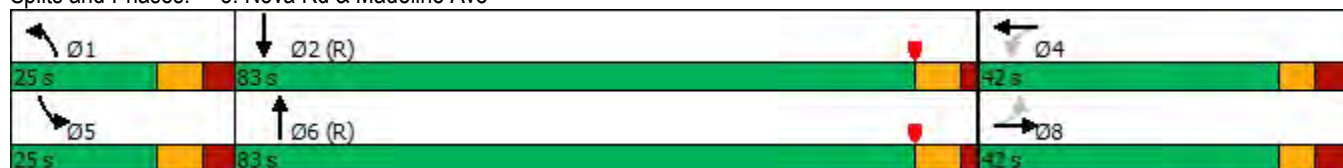
Intersection LOS: C

Intersection Capacity Utilization 80.4%

ICU Level of Service D

Analysis Period (min) 15























Splits and Phases: 3: Nova Rd & Madeline Ave



Lanes and Geometrics

3: Nova Rd & Madeline Ave

Existing PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	86	161	164	52	115	52	192	1005	54	70	1342	145
Future Volume (vph)	86	161	164	52	115	52	192	1005	54	70	1342	145
Satd. Flow (prot)	1662	1680	0	1745	1716	0	1787	5050	0	1787	5054	0
Flt Permitted	0.557			0.211			0.950			0.950		
Satd. Flow (perm)	974	1680	0	388	1716	0	1787	5050	0	1787	5054	0
Satd. Flow (RTOR)		31			14			7			15	
Lane Group Flow (vph)	87	329	0	53	169	0	194	1070	0	71	1502	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8			4								
Total Split (s)	50.0	50.0		50.0	50.0		30.0	85.0		25.0	80.0	
Total Lost Time (s)	11.5	8.5		11.5	8.5		8.6	7.1		8.6	7.1	
Act Effect Green (s)	31.4	34.4		31.4	34.4		21.5	89.7		11.7	79.9	
Actuated g/C Ratio	0.20	0.22		0.20	0.22		0.13	0.56		0.07	0.50	
v/c Ratio	0.46	0.85		0.70	0.45		0.81	0.38		0.55	0.59	
Control Delay	63.1	74.7		101.7	52.4		91.3	21.1		86.4	30.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	63.1	74.7		101.7	52.4		91.3	21.1		86.4	30.6	
LOS	E	E		F	D		F	C		F	C	
Approach Delay		72.3			64.2			31.9			33.1	
Approach LOS		E			E			C			C	

Intersection Summary

Cycle Length: 160

Actuated Cycle Length: 160

Offset: 153 (96%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 39.3

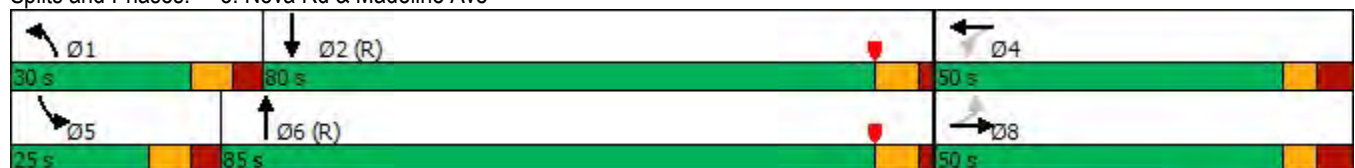
Intersection LOS: D

Intersection Capacity Utilization 94.8%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 3: Nova Rd & Madeline Ave



Approach	EB	WB	NB	SB
Crosswalk Length (ft)	34.0	34.1	121.9	122.0
Crosswalk Width (ft)	12.0	12.0	12.0	12.0
Total Number of Lanes Crossed	3	3	7	7
Number of Right-Turn Islands	0	0	0	0
Type of Control	Actuated	Actuated	Actuated	Actuated
Corresponding Signal Phase	2	6	8	4
Effective Walk Time (s)	14.0	14.0	14.0	14.0
Right Corner Size A (ft)	9.0	9.0	9.0	9.0
Right Corner Size B (ft)	9.0	9.0	9.0	9.0
Right Corner Curb Radius (ft)	0.0	0.0	0.0	0.0
Right Corner Total Area (sq.ft)	81.00	81.00	81.00	81.00
Ped. Left-Right Flow Rate (p/h)	0	0	0	0
Ped. Right-Left Flow Rate (p/h)	0	0	0	0
Ped. R. Sidewalk Flow Rate (p/h)	0	0	0	0
Veh. Perm. L. Flow in Walk (v/h)	192	70	52	86
Veh. Perm. R. Flow in Walk (v/h)	145	54	164	52
Veh. RTOR Flow in Walk (v/h)	0	0	0	0
85th percentile speed (mph)	35	35	50	50
Right Corner Area per Ped (sq.ft)	0.0	0.0	0.0	0.0
Right Corner Quality of Service	-	-	-	-
Ped. Circulation Area (sq.ft)	0.0	0.0	0.0	0.0
Crosswalk Circulation Code	-	-	-	-
Pedestrian Delay (s/p)	66.6	66.6	66.6	66.6
Pedestrian Compliance Code	Poor	Poor	Poor	Poor
Pedestrian Crosswalk Score	2.57	2.26	3.35	3.38
Pedestrian Crosswalk LOS	C	B	C	C

Approach	EB	WB	NB	SB
Bicycle Flow Rate (bike/h)	0	0	0	0
Total Flow Rate (veh/h)	416	222	1264	1573
Effct. Green for Bike (s)	34.4	34.4	89.7	79.9
Cross Street Width (ft)	121.9	122.0	34.1	34.0
Through Lanes Number	1	1	3	3
Through Lane Width (ft)	11.0	11.0	12.0	12.0
Bicycle Lane Width (ft)	0.0	0.0	5.0	5.0
Striped Parking Lane Width (ft)	0.0	0.0	0.0	0.0
Paved Shoulder Width (ft)	3.0	3.0	0.0	0.0
Curb Is Present?	No	No	No	No
On Street Parking?	No	No	No	No
Bicycle Lane Capacity (bike/h)	430	430	1121	999
Bicycle Delay (s/bike)	49.3	49.3	15.4	20.1
Bicycle Compliance	Poor	Poor	Fair	Fair
Bicycle LOS Score	3.68	3.36	1.70	1.87
Bicycle LOS	D	C	B	B

Left Turn Phase Warrant Study

City: Port Orange
County: Volusia

Analyst: VHB
Date: 4/11/2022

Major Street: Nova Road
Minor Street: Madeline Avenue

Critical Approach Speed: 35 MPH
(opposing the left turn)

Eastbound Left Turn Phase

Applicable: ☒ **Yes**
Satisfied: ☒ **Yes**

If any one of the six criteria below is satisfied, then a protected (procted-permissive or protected -only) left turn phase may be installed

Criteria	Data							Fulfilled?	
1. Has there been more than four left turn crashes in one year, or six left turn crashes in two years? If yes, protected phasing recommended.	Year			Left Turn Crashes				<input type="checkbox"/>	No
	2020			2					
	2020 & 2021			2					
2. Does left turn-driver have 5.5 seconds equivalent sight distance to oncoming vehicles? If not, protected phasing recommended.	Equivalent Sight Distance							<input type="checkbox"/>	No
	14.6								
3. Number of left turn lanes on subject approach. If more than one, then protected phasing recommended.	Number of Left Turn Lanes							<input type="checkbox"/>	No
	1								
4. Number of through lanes on opposing apporach. If four or more, than protected phasing recommended.	Number of Opposing Through Lanes							<input type="checkbox"/>	No
	1								
5. Is left turn delay ≥ 2.0 veh-hours, and 35 sec/veh during the peak hour. If yes, then protected phasing recommended.	Avg Veh Delay (sec/veh)			Left Turn Delay (veh-hours)				<input checked="" type="checkbox"/>	Yes
	135			3.75					
6. Is left-turn volume > 2 vehicles per cycle during the peak hour AND cross product of one lane approach $> 50,000$ or $100,000$ for two lane approach? If yes, then protected phasing	Cycle Length		Peak Volume		Veh/Cycle			<input type="checkbox"/>	No
	150		100		4.2				
Time	7-8 AM	8-9 AM	11-12	12-13	14-15	15-16	16-17	17-18	
EBL Volume	63	76	81	93	80	108	91	77	
WB Opposing Volume	202	141	84	130	159	136	142	136	
Crossproduct	12,726	10,716	6,804	12,090	12,720	14,688	12,922	10,472	

Notes:

- 1) Field delay were not collected for the EBL movement. HCM based delay is used instead
- 2) Equivalent Sight Distance is from the Left Turn Phase Warrant Study completed by FDOT in November 2019
- 3) Cycle length is from existing signal timings provided by FDOT
- 4) Right turns on red were included in the crossproduct

Left Turn Phase Warrant Study

City: Port Orange
County: Volusia

Analyst: VHB
Date: 4/10/2022

Major Street: Nova Road
Minor Street: Madeline Avenue

Critical Approach Speed: 35 MPH
(opposing the left turn)

Westbound Left Turn Phase

Applicable: ☒ **Yes**
Satisfied: ☐ **No**

If any one of the six criteria below is satisfied, then a protected (procted-permissive or protected -only) left turn phase may be installed

Criteria	Data						Fulfilled?		
1. Has there been more than four left turn crashes in one year, or six left turn crashes in two years? If yes, protected phasing recommended.	Year		Left Turn Crashes				<input type="checkbox"/>	No	
	2020		0						
	2020 & 2021		1						
2. Does left turn-driver have 5.5 seconds equivalent sight distance to oncloming vehicles? If not, protected phasing recommended.	Equivalent Sight Distance						<input type="checkbox"/>	No	
	20.1								
3. Number of left turn lanes on subject approach. If more than one, then protected phasing recommended.	Number of Left Turn Lanes						<input type="checkbox"/>	No	
	1								
4. Number of through lanes on opposing apporach. If four or more, than protected phasing recommended.	Number of Opposing Through Lanes						<input type="checkbox"/>	No	
	1								
5. Is left turn delay ≥ 2.0 veh-hours, and 35 sec/veh during the peak hour. If yes, then protected phasing recommended.	Avg Veh Delay (sec/veh)			Left Turn Delay (veh-hours)			<input type="checkbox"/>	No	
	81.6			1.2					
6. Is left-turn volume > 2 vehicles per cycle during the peak hour AND cross product of one lane approach > 50,000 or 100,000 for two lane approach? If yes, then protected phasing	Cycle Length		Peak Volume		Veh/Cycle			<input type="checkbox"/>	No
	160		52		2.3				
Time	7-8 AM	8-9 AM	11-12	12-13	14-15	15-16	16-17	17-18	
WBL Volume	50	48	33	36	38	33	36	38	
EB Opposing Volume	194	185	176	191	230	270	250	229	
Crossproduct	9,700	8,880	5,808	6,876	8,740	8,910	9,000	8,702	

Notes:

- 1) Field delay was not collected for the WBL movement. HCM based delay was used instead
- 2) Equivalent Sight Distance is from the Left Turn Phase Warrant Study completed by FDOT in November 2019
- 3) Cycle length is from existing signal timings provided by FDOT
- 4) Right turns on red were included in the crossproduct

APPENDIX C:

Crash Data

Crash Data Summary - Madeline Ave at S Nova Road

No.	Crash ID	Date	Day	Time	Hour	Year	Crash Type	Crash Severity	Fatalities	Injuries	Property Damage	Day/Night	Wet/Dry	Alcohol Related	Drug Related
1	89398399	3/11/2021	Thursday	12:10 PM	12	2021	Angle	No Injury	0	0	\$0	Daylight	Dry	N	N
2	24033118	4/2/2021	Friday	4:25 PM	16	2021	Rear End	Injury	0	1	\$0	Daylight	Dry	N	N
3	87119106	11/21/2017	Tuesday	1:25 AM	01	2017	Angle	Injury	0	3	\$3,000	Dark - Not Lighted	Dry	N	N
4	87740124	8/25/2019	Sunday	3:50 PM	15	2019	Rear End	No Injury	0	0	\$0	Daylight	Dry	N	N
5	87510020	9/15/2018	Saturday	10:14 AM	10	2018	Rear End	Injury	0	2	\$0	Daylight	Dry	N	N
6	86396450	5/25/2018	Friday	6:58 PM	18	2018	Off Road	No Injury	0	0	\$0	Daylight	Dry	N	N
7	87740743	11/27/2019	Wednesday	7:13 AM	07	2019	Rear End	No Injury	0	0	\$0	Daylight	Dry	N	N
8	85812774	2/3/2016	Wednesday	4:35 PM	16	2016	Rear End	No Injury	0	0	\$0	Daylight	Dry	N	N
9	87740387	12/2/2019	Monday	5:12 PM	17	2019	Off Road	Injury	0	2	\$0	Daylight	Dry	N	N
10	85813453	7/18/2016	Monday	12:34 PM	12	2016	Rear End	No Injury	0	0	\$0	Daylight	Dry	N	N
11	86396149	1/12/2017	Thursday	7:19 AM	07	2017	Rear End	No Injury	0	0	\$0	Daylight	Dry	N	N
12	87738917	1/13/2019	Sunday	2:02 PM	14	2019	Angle	No Injury	0	0	\$0	Daylight	Dry	N	N
13	87740504	12/23/2019	Monday	4:06 PM	16	2019	Sideswipe	No Injury	0	0	\$0	Daylight	Dry	N	N
14	87510617	1/4/2019	Friday	7:00 PM	19	2019	Rear End	No Injury	0	0	\$0	Dark - Lighted	Wet	N	N
15	24032702	1/16/2021	Saturday	9:20 AM	09	2021	Sideswipe	No Injury	0	0	\$0	Daylight	Dry	N	N
16	87740275	9/20/2019	Friday	3:35 PM	15	2019	Rear End	No Injury	0	0	\$0	Daylight	Dry	N	N
17	87739715	6/30/2019	Sunday	11:45 PM	23	2019	Left Turn	No Injury	0	0	\$0	Dark - Not Lighted	No Injury	N	N
18	87739595	3/27/2019	Wednesday	7:48 PM	19	2019	Left Turn	Injury	0	1	\$0	Dark - Not Lighted	Wet	N	N
19	87510338	10/6/2018	Saturday	11:40 PM	23	2018	Left Turn	No Injury	0	0	\$0	Dark - Not Lighted	Dry	N	N
20	87510318	3/11/2018	Sunday	9:19 PM	21	2018	Rear End	No Injury	0	0	\$0	Dark - Not Lighted	Dry	N	N
21	87509976	8/19/2018	Sunday	2:37 PM	14	2018	Sideswipe	No Injury	0	0	\$0	Daylight	Dry	N	N
22	87739517	11/4/2019	Monday	6:34 PM	18	2019	Angle	No Injury	0	0	\$0	Dark - Lighted	Wet	N	N
23	86751680	4/19/2017	Wednesday	11:08 AM	11	2017	Angle	Serious Injury	0	2	\$0	Daylight	Dry	N	N
24	86751570	10/8/2017	Sunday	11:06 AM	11	2017	Angle	Serious Injury	0	3	\$0	Daylight	Dry	N	N
25	86396460	11/3/2017	Friday	5:44 PM	17	2017	Rear End	Injury	0	1	\$0	Daylight	Dry	N	N
26	86396372	7/22/2017	Saturday	3:03 PM	15	2017	Left Turn	Injury	0	1	\$0	Daylight	Wet	N	N
27	86396537	2/24/2017	Friday	9:50 AM	09	2017	Off Road	No Injury	0	0	\$0	Daylight	Dry	N	N
28	85813308	7/1/2016	Friday	2:31 AM	02	2016	Rear End	Injury	0	1	\$0	Dark - Not Lighted	Dry	Y	N
29	84154190	1/28/2016	Thursday	1:50 AM	01	2016	Other	No Injury	0	0	\$0	Dark - Not Lighted	Wet	N	N
30	85812450	3/6/2016	Sunday	6:37 PM	18	2016	Rear End	No Injury	0	0	\$0	Daylight	Dry	N	N
31	85812803	2/10/2016	Wednesday	1:53 PM	13	2016	Rear End	No Injury	0	0	\$0	Daylight	Dry	N	N
32	85813147	4/26/2016	Tuesday	9:32 AM	09	2016	Right Turn	No Injury	0	0	\$0	Daylight	Dry	N	N
33	87509882	8/17/2018	Friday	1:10 PM	13	2018	Left Turn	No Injury	0	0	\$0	Daylight	Dry	N	N
34	87510652	3/17/2019	Sunday	2:04 PM	14	2019	Sideswipe	No Injury	0	0	\$0	Daylight	Wet	N	N
35	87739184	2/1/2019	Friday	1:40 PM	13	2019	Sideswipe	No Injury	0	0	\$0	Daylight	Dry	N	N
36	86396485	12/30/2017	Saturday	7:45 PM	19	2017	Rear End	No Injury	0	0	\$0	Dark - Lighted	Dry	N	N
37	87509791	3/31/2018	Saturday	5:15 PM	17	2018	Rear End	Serious Injury	0	2	\$0	Daylight	Dry	Y	N
38	87740730	11/11/2019	Monday	6:50 PM	18	2019	Rear End	Injury	0	1	\$0	Dark - Not Lighted	Dry	N	N
39	86396511	2/27/2017	Monday	4:18 PM	16	2017	Rear End	No Injury	0	0	\$0	Daylight	Dry	N	N
40	87510381	8/29/2018	Wednesday	8:19 AM	08	2018	Rear End	Injury	0	1	\$0	Daylight	Dry	N	N
41	87509716	11/16/2017	Thursday	3:27 PM	15	2017	Rear End	Injury	0	2	\$0	Daylight	Dry	N	N
42	24033383	2/1/2021	Monday	3:41 PM	15	2021	Sideswipe	No Injury	0	0	\$0	Daylight	Dry	N	N
43	24032251	11/1/2020	Sunday	1:20 AM	01	2020	Rollover	Injury	0	2	\$0	Dark - Not Lighted	Dry	N	N
44	24032492	8/13/2020	Thursday	9:09 AM	09	2020	Sideswipe	No Injury	0	0	\$0	Daylight	Dry	N	N
45	24032430	11/7/2020	Saturday	6:34 PM	18	2020	Off Road	No Injury	0	0	\$1,000	Dark - Not Lighted	Dry	N	N
46	24032474	8/8/2020	Saturday	12:01 AM	00	2020	Left Turn	Fatality	1	2	\$5,000	Dark - Lighted	Wet	Y	Y
47	24032824	11/17/2020	Tuesday	5:46 PM	17	2020	Left Turn	Injury	0	1	\$0	Dusk	Dry	N	N
48	86751713	11/20/2017	Monday	6:10 PM	18	2017	Left Turn	No Injury	0	0	\$0	Dusk	Dry	N	N
49	87738602	4/27/2019	Saturday	9:00 PM	21	2019	Other	No Injury	0	0	\$0	Dark - Lighted	Dry	Y	N
50	87739836	5/30/2019	Thursday	11:27 AM	11	2019	Rear End	Injury	0	1	\$0	Daylight	Dry	N	N
51	89399168	10/20/2021	Wednesday	8:15 PM	20	2021	Left Turn	No Injury	0	0	\$0	Dark - Lighted	Dry	N	N
52	89399323	12/1/2021	Wednesday	2:07 PM	14	2021	Right Turn	No Injury	0	0	\$0	Daylight	Dry	N	N
53	89399146	10/13/2021	Wednesday	1:40 PM	13	2021	Left Turn	No Injury	0	0	\$0	Daylight	Dry	N	N
54	89399087	9/29/2021	Wednesday	8:00 PM	20	2021	Left Turn	Injury	0	1	\$0	Dark - Lighted	Dry	N	N
55	87741119	2/28/2020	Friday	11:10 AM	11	2020	Angle	No Injury	0	0	\$0	Daylight	Dry	N	N
56	87741294	5/26/2020	Tuesday	9:55 AM	09	2020	Angle	Injury	0	2	\$0	Daylight	Wet	N	N
57	24032214	10/8/2020	Thursday	6:10 PM	18	2020	Rear End	Injury	0	1	\$0	Daylight	Dry	N	N
58	24032575	10/27/2020	Tuesday	4:32 PM	16	2020	Sideswipe	Injury	0	1	\$0	Daylight	Dry	N	N
59	24032062	10/5/2020	Monday	1:00 PM	13	2020	Rear End	Injury	0	1	\$0	Daylight	Dry	N	N
60	89398566	5/4/2021	Tuesday	8:20 PM	20	2021	Left Turn	No Injury	0	0	\$0	Dark - Lighted	Wet	N	N
61	89399051	9/17/2021	Friday	5:10 PM	17	2021	Rear End	Injury	0	1	\$0	Daylight	Dry	N	N
62	24032490	8/25/2020	Tuesday	10:33 AM	10	2020	Rear End	No Injury	0	0	\$0	Daylight	Dry	N	N
63	89398881	8/4/2021	Wednesday	9:50 PM	21	2021	Right Turn	No Injury	0	0	\$0	Dark - Lighted	Wet	Y	N
64	24032113	8/3/2020	Monday	5:44 AM	05	2020	Off Road	No Injury	0	0	\$300	Dark - Lighted	Dry	N	N
65	86752386	4/11/2018	Wednesday	7:55 PM	19	2018	Left Turn	Injury	0	1	\$0	Dark - Lighted	Dry	N	N
66	24032094	6/3/2020	Wednesday	4:21 PM	16	2020	Rear End	No Injury	0	0	\$0	Daylight	Dry	N	N

Crash Data Summary - Madeline Ave at S Nova Road

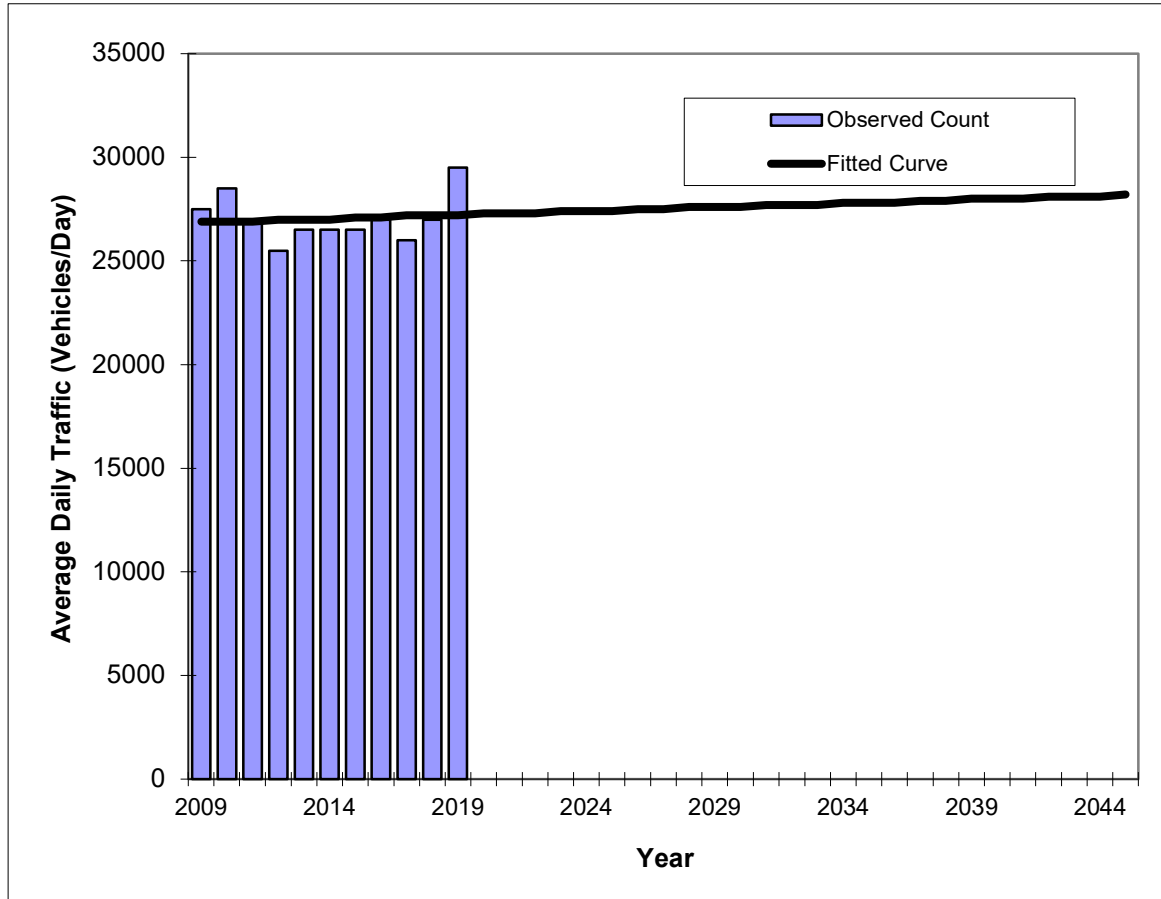
No.	Crash ID	Date	Day	Time	Hour	Year	Crash Type	Crash Severity	Fatalities	Injuries	Property Damage	Day/Night	Wet/Dry	Alcohol Related	Drug Related
67	87740785	12/6/2019	Friday	3:43 PM	15	2019	Rear End	Injury	0	1	\$0	Daylight	Dry	N	N
68	89398892	8/6/2021	Friday	1:11 PM	13	2021	Bicycle	Serious Injury	0	1	\$250	Daylight	Dry	N	N
69	24032246	8/22/2020	Saturday	10:00 AM	10	2020	Rear End	Injury	0	1	\$0	Daylight	Dry	N	N
70	87741290	3/7/2020	Saturday	8:43 PM	20	2020	Rear End	No Injury	0	0	\$0	Dark - Lighted	Dry	N	N
71	89398655	5/31/2021	Monday	10:05 AM	10	2021	Rear End	Injury	0	2	\$0	Daylight	Dry	N	N

APPENDIX D:
Future Traffic Development

Traffic Trends - V03.a **NOVA RD (NEW) -- Madeline Ave to Big Tree**

FIN#	1234
Location	1

County:	Volusia (79)
Station #:	363
Highway:	NOVA RD (NEW)



Year	Traffic (ADT/AADT)	
	Count*	Trend**
2009	27500	26900
2010	28500	26900
2011	27000	26900
2012	25500	27000
2013	26500	27000
2014	26500	27000
2015	26500	27100
2016	27000	27100
2017	26000	27200
2018	27000	27200
2019	29500	27200
2025 Opening Year Trend		
2025	N/A	27400
2035 Mid-Year Trend		
2035	N/A	27800
2045 Design Year Trend		
2045	N/A	28200
TRANPLAN Forecasts/Trends		

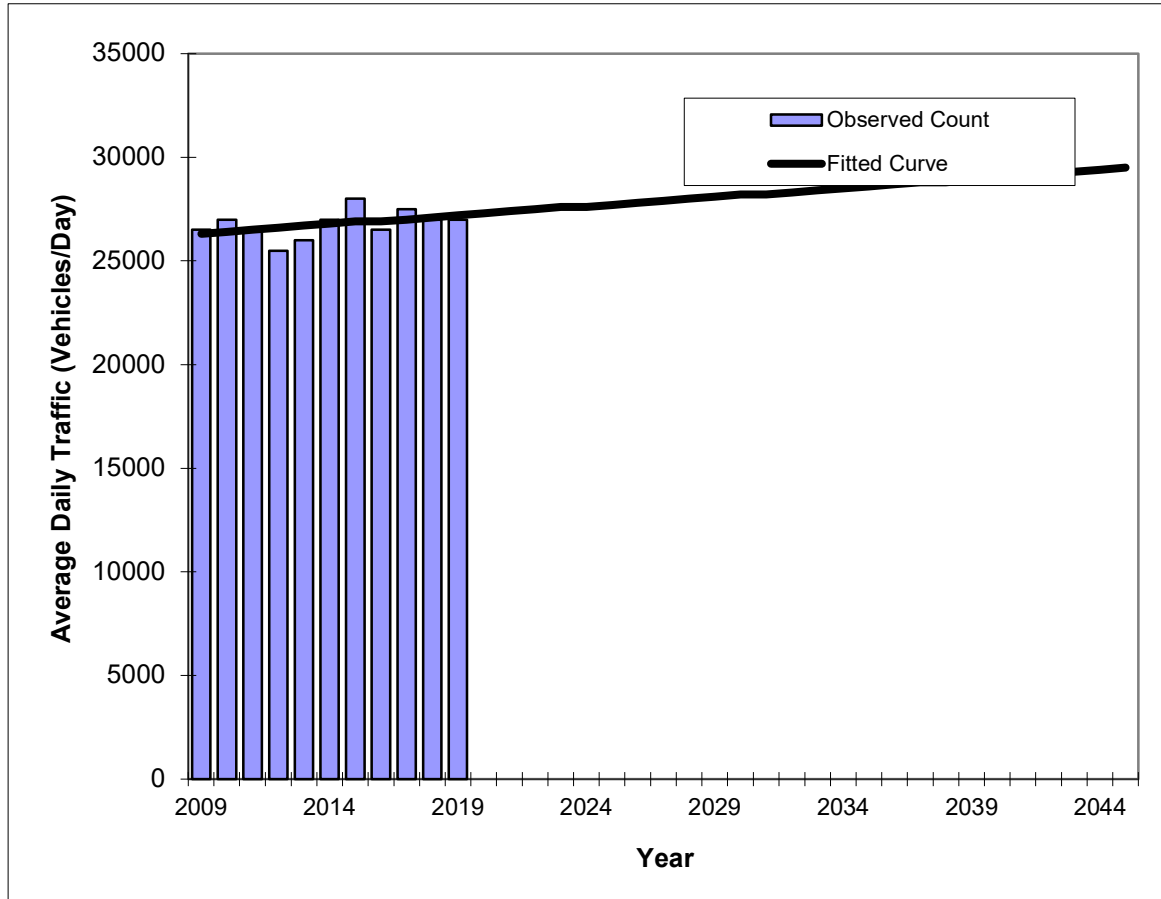
** Annual Trend Increase:	36
Trend R-squared:	1.14%
Trend Annual Historic Growth Rate:	0.11%
Trend Growth Rate (2019 to Design Year):	0.14%
Printed:	21-Jan-22
Straight Line Growth Option	

*Axle-Adjusted

Traffic Trends - V03.a **NOVA RD (NEW) -- SR 421 to Madeline Ave**

FIN#	1234
Location	1

County:	Volusia (79)
Station #:	1017
Highway:	NOVA RD (NEW)



Traffic (ADT/AADT)		
Year	Count*	Trend**
2009	26500	26300
2010	27000	26400
2011	26500	26500
2012	25500	26600
2013	26000	26700
2014	27000	26800
2015	28000	26900
2016	26500	26900
2017	27500	27000
2018	27000	27100
2019	27000	27200
2025 Opening Year Trend		
2025	N/A	27700
2035 Mid-Year Trend		
2035	N/A	28600
2045 Design Year Trend		
2045	N/A	29500
TRANPLAN Forecasts/Trends		

** Annual Trend Increase:	86
Trend R-squared:	17.52%
Trend Annual Historic Growth Rate:	0.34%
Trend Growth Rate (2019 to Design Year):	0.33%
Printed:	21-Jan-22
Straight Line Growth Option	

*Axle-Adjusted

Projections of Florida Population by County, 2025–2045, with Estimates for 2020

Stefan Rayer, Population Program Director
Ying Wang, Research Demographer

The Bureau of Economic and Business Research (BEBR) has been making population projections for Florida and its counties since the 1970s. This report presents our most recent set of projections and describes the methodology used to construct those projections. To account for uncertainty regarding future population growth, we publish three series of projections. We believe the medium series is the most likely to provide accurate forecasts in most circumstances, but the low and high series provide an indication of the uncertainty surrounding the medium series. It should be noted that these projections refer solely to permanent residents of Florida; they do not include tourists or seasonal residents. Furthermore, we note that this set of projections is still based on the Census 2010 counts and the BEBR population estimates since then. The next set of BEBR county projections, scheduled for release in early 2022, will incorporate the Census 2020 counts.

State projections

The starting point for the state-level projections was the April 1, 2010 census population count by age, sex, race, and Hispanic origin, as adjusted by the National Center for Health Statistics (NCHS) in the Vintage 2017 bridged race population estimates. Projections were made in one-year intervals using a cohort-component methodology in which births, deaths, and migration are projected separately for each age-sex cohort in Florida for non-Hispanic whites, non-Hispanic nonwhites, and Hispanics. We applied three

different sets of assumptions to provide low, medium, and high series of projections. Although the low and high series do not provide absolute bounds on future population change, they provide a reasonable range in which Florida's future population is likely to fall.

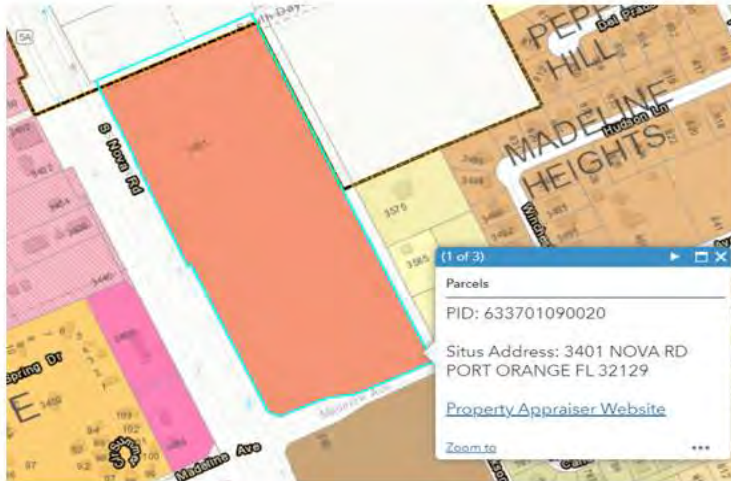
Survival rates were applied by single year of age, sex, race, and Hispanic origin to project future deaths in the population. These rates were based on Florida Life Tables for 2012–2018, using mortality data published by the Office of Vital Statistics in the Florida Department of Health. The survival rates were adjusted upward each year until 2044 to account for projected increases in life expectancy. These adjustments were based on projected increases in survival rates released by the U.S. Census Bureau. We used the same mortality assumptions for all three series of projections because there is less uncertainty regarding future changes in mortality rates than is true for migration and fertility rates.

Domestic migration rates by age and sex were based on Public Use Microdata Sample (PUMS) files from the 2010–2019 American Community Survey (ACS) 1-year estimates, and the 2014–2018 and 2015–2019 ACS 5-year estimates. We first calculated an average of the 2010–2018 1-year estimates and the 2014–2018 5-year estimates. Next, we calculated an average of the 2011–2019 1-year estimates and the 2015–2019 5-year estimates. Our final domestic migration rates were based on an average of these two

Projections of Florida Population by County, 2025–2045, with Estimates for 2020 (continued)

County and State	Estimates April 1, 2020	2025	2030	2035	2040	2045
SANTA ROSA	184,653					
Low		182,000	187,800	191,600	194,400	195,700
Medium		201,800	215,900	227,800	238,700	248,500
High		220,200	244,000	267,100	290,100	313,300
SARASOTA	438,816					
Low		432,900	442,400	449,000	453,100	454,900
Medium		472,100	498,200	520,400	539,900	557,500
High		507,100	549,800	588,600	625,900	661,900
SEMINOLE	476,727					
Low		471,200	480,600	487,500	491,400	492,200
Medium		505,100	528,500	548,400	565,100	579,400
High		537,900	578,400	614,700	648,100	678,300
SUMTER	141,422					
Low		148,800	162,100	171,400	178,000	182,100
Medium		167,800	190,000	208,200	223,800	237,900
High		185,000	218,000	249,600	280,000	310,600
SUWANNEE	45,463					
Low		44,100	44,400	44,400	44,200	43,900
Medium		47,200	48,700	49,900	50,800	51,700
High		50,600	53,800	56,800	59,400	62,000
TAYLOR	22,436					
Low		20,900	20,400	19,900	19,300	18,600
Medium		22,800	23,000	23,100	23,200	23,300
High		24,700	25,800	26,800	27,700	28,600
UNION	15,410					
Low		14,300	14,000	13,500	13,100	12,600
Medium		15,600	15,700	15,800	15,800	15,800
High		16,900	17,600	18,300	18,800	19,300
VOLUSIA	551,588					
Low		544,700	553,500	558,000	560,500	561,900
Medium		583,900	608,900	628,800	646,100	662,000
High		621,800	666,200	703,500	739,300	774,300
WAKULLA	33,981					
Low		33,400	34,200	34,700	34,800	34,700
Medium		36,400	38,400	40,100	41,400	42,600
High		39,300	42,900	46,400	49,400	52,300
WALTON	74,724					
Low		76,100	81,300	85,000	87,900	90,200
Medium		85,900	95,500	103,600	110,900	117,900
High		94,600	109,300	123,800	138,300	153,900
WASHINGTON	25,334					
Low		24,100	23,900	23,600	23,200	22,700
Medium		26,200	26,800	27,300	27,700	28,100
High		28,400	30,200	31,800	33,300	34,800
FLORIDA	21,596,068					
Low		22,164,100	23,037,100	23,650,600	24,090,900	24,405,600
Medium		23,138,600	24,419,100	25,461,900	26,356,400	27,149,800
High		24,109,200	25,798,900	27,275,900	28,634,200	29,921,300

Future Land Use and Zoning - Northeast and Southeast Quadrants



3401 Nova Rd.

Acreage: +/- 15.5 acres

FLU: Commercial (FAR 0.5)

Zoning: PCD without an MDA

Estimated Buildable Sq.ft. = 270,000



950 Madeline Ave.

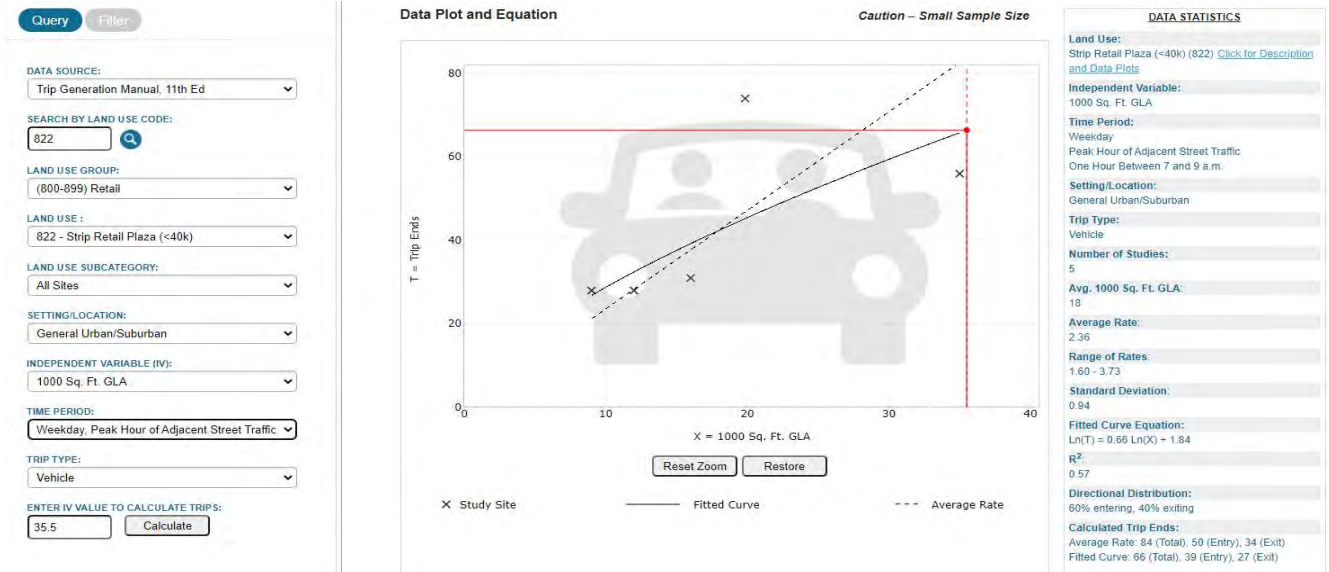
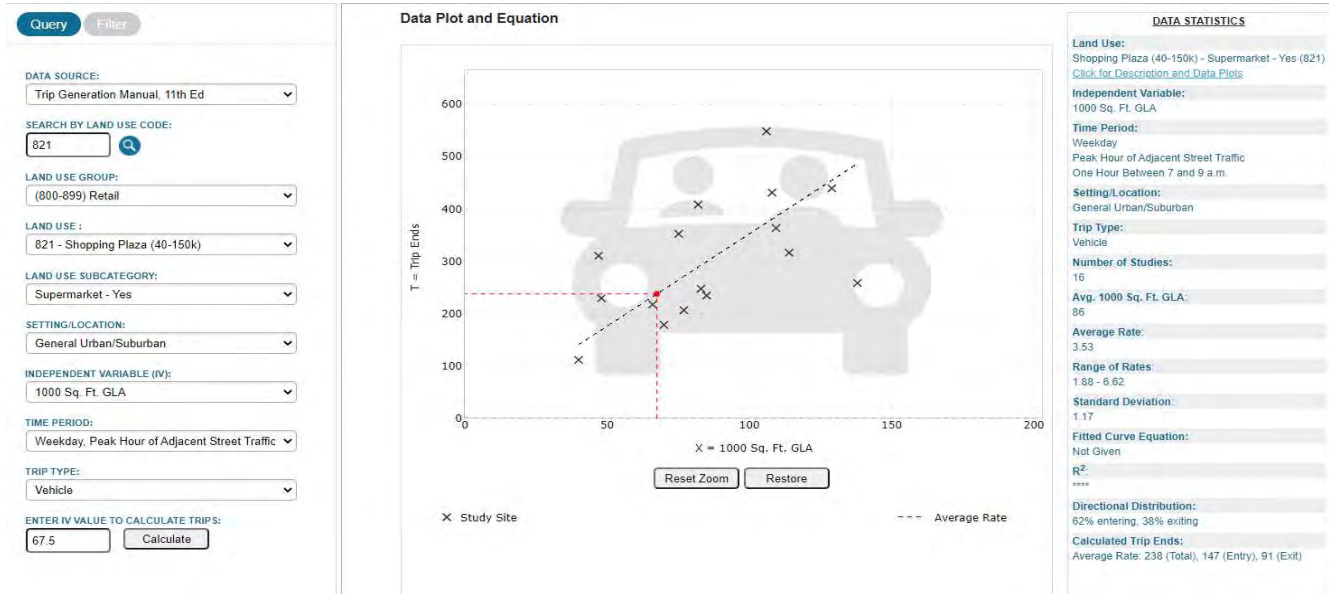
Acreage: +/- 8.11 acres

FLU: Commercial (FAR 0.5)

Zoning: R-3M (12 units/acre)

Estimated Buildable Sq.ft. = 141,300

ITE Trip Generation Manual Vested Trips Calculation - AM Peak Hour



ITE Trip Generation Manual Vested Trips Calculation - PM Peak Hour

Query Filter

DATA SOURCE:

Trip Generation Manual, 11th Ed

SEARCH BY LAND USE CODE:

821

LAND USE GROUP:

(800-899) Retail

LAND USE:

821 - Shopping Plaza (40-150k)

LAND USE SUBCATEGORY:

Supermarket - Yes

SETTING/LOCATION:

General Urban/Suburban

INDEPENDENT VARIABLE (IV):

1000 Sq. Ft. GLA

TIME PERIOD:

Weekday, Peak Hour of Adjacent Street Traffic

TRIP TYPE:

Vehicle

ENTER IV VALUE TO CALCULATE TRIPS:

67.5

Calculate

DATA SOURCE:

Trip Generation Manual, 11th Ed

SEARCH BY LAND USE CODE:

822

LAND USE GROUP:

(800-899) Retail

LAND USE:

822 - Strip Retail Plaza (<40k)

LAND USE SUBCATEGORY:

All Sites

SETTING/LOCATION:

General Urban/Suburban

INDEPENDENT VARIABLE (IV):

1000 Sq. Ft. GLA

TIME PERIOD:

Weekday, Peak Hour of Adjacent Street Traffic

TRIP TYPE:

Vehicle

ENTER IV VALUE TO CALCULATE TRIPS:

35.5

Calculate

Data Plot and Equation

Reset Zoom

Restore

DATA STATISTICS

Land Use:

Shopping Plaza (40-150k) - Supermarket - Yes (821)

Independent Variable:

1000 Sq. Ft. GLA

Time Period:

Weekday
Peak Hour of Adjacent Street Traffic
One Hour Between 4 and 6 p.m.

Setting/Location:

General Urban/Suburban

Trip Type:

Vehicle

Number of Studies:

51

Avg. 1000 Sq. Ft. GLA:

87

Average Rate:

9.03

Range of Rates:

5.35 - 16.45

Standard Deviation:

2.37

Fitted Curve Equation:

$T = 7.67(X) + 118.86$

R²:

0.62

Directional Distribution:

48% entering, 52% exiting

Calculated Trip Ends:

Average Rate: 610 (Total), 293 (Entry), 317 (Exit)
Fitted Curve: 637 (Total), 306 (Entry), 331 (Exit)

Data Plot and Equation

Reset Zoom

Restore

DATA STATISTICS

Land Use:

Strip Retail Plaza (<40k) (822)

Independent Variable:

1000 Sq. Ft. GLA

Time Period:

Weekday
Peak Hour of Adjacent Street Traffic
One Hour Between 4 and 6 p.m.

Setting/Location:

General Urban/Suburban

Trip Type:

Vehicle

Number of Studies:

25

Avg. 1000 Sq. Ft. GLA:

21

Average Rate:

6.59

Range of Rates:

2.81 - 15.20

Standard Deviation:

2.94

Fitted Curve Equation:

$\ln(T) = 0.71 \ln(X) + 2.72$

R²:

0.56

Directional Distribution:

50% entering, 50% exiting

Calculated Trip Ends:

Average Rate: 234 (Total), 117 (Entry), 117 (Exit)
Fitted Curve: 191 (Total), 95 (Entry), 96 (Exit)

FUTURE TURNING MOVEMENT COUNT CALCULATION - BACKGROUND PLUS POTENTIAL VESTED TRIPS























Study Intersection		2021 AM	2025 Background		Project Trips	Total 2025 AM	2021 PM	2025 Background		Project Trips	Total 2025 PM
			Growth	2025 AM				Growth	2025 PM		
Madeline Avenue	EBL	100	1%	104	8	112	86	1%	89	16	105
	EBT	84	1%	87	26	113	161	1%	167	58	225
	EBR	143	1%	149		149	164	1%	171		171
	WBL	54	1%	56	6	62	52	1%	54	25	79
	WBT	133	1%	138	14	152	115	1%	120	57	177
	WBR	113	1%	118	12	130	52	1%	54	26	80
Nova Road	NBL	104	1%	108	5	113	192	1%	200	10	210
	NBT	1,093	1%	1,137	122	1,259	1,005	1%	1,045	282	1,327
	NBR	27	1%	28	8	36	54	1%	56	19	75
	SBL	48	1%	50	16	66	70	1%	73	25	98
	SBT	888	1%	924		924	1,342	1%	1,396		1,396
	SBR	88	1%	92		92	145	1%	151		151

APPENDIX E:
2025 Synchro Analysis Outputs

Lanes and Geometrics

3: Nova Rd & Madeline Ave

2025 No-Build AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	112	113	149	62	152	130	113	1259	36	66	924	92
Future Volume (vph)	112	113	149	62	152	130	113	1259	36	66	924	92
Satd. Flow (prot)	1728	1673	0	1745	1676	0	1805	5068	0	1805	4974	0
Flt Permitted	0.269			0.312			0.950			0.950		
Satd. Flow (perm)	489	1673	0	573	1676	0	1805	5068	0	1805	4974	0
Satd. Flow (RTOR)		47			30			3			13	
Lane Group Flow (vph)	124	292	0	69	313	0	126	1439	0	73	1129	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8			4								
Total Split (s)	57.0	57.0		57.0	57.0		30.0	69.0		24.0	63.0	
Total Lost Time (s)	11.5	8.5		11.5	8.5		8.6	7.1		8.6	7.1	
Act Effect Green (s)	30.4	33.4		30.4	33.4		15.7	81.0		11.4	76.7	
Actuated g/C Ratio	0.20	0.22		0.20	0.22		0.10	0.54		0.08	0.51	
v/c Ratio	1.25	0.72		0.60	0.79		0.67	0.53		0.53	0.44	
Control Delay	221.7	53.9		73.3	63.3		81.1	24.7		80.1	25.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	221.7	53.9		73.3	63.3		81.1	24.7		80.1	25.4	
LOS	F	D		E	E		F	C		F	C	
Approach Delay		103.9			65.1			29.3			28.8	
Approach LOS		F			E			C			C	

Intersection Summary

Cycle Length: 150

Actuated Cycle Length: 150

Offset: 85 (57%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.25

Intersection Signal Delay: 41.6

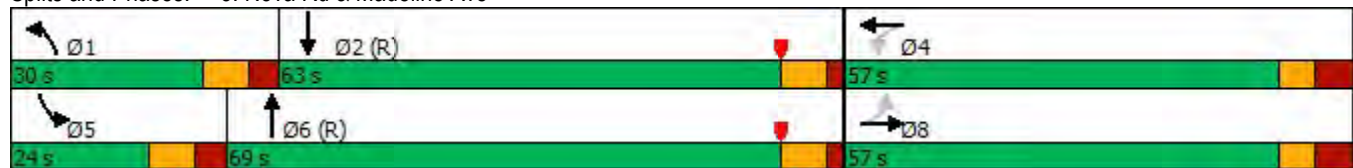
Intersection LOS: D

Intersection Capacity Utilization 85.8%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 3: Nova Rd & Madeline Ave



Network Totals

Number of Intersections	1
Total Delay (hr)	37
Stops (#)	2207
Average Speed (mph)	12
Total Travel Time (hr)	50
Distance Traveled (mi)	587
Fuel Consumed (gal)	77
Fuel Economy (mpg)	7.7
Unserved Vehicles (#)	0
Vehicles in dilemma zone (#)	90
Performance Index	43.3























Approach	EB	WB	NB	SB
Crosswalk Length (ft)	34.0	34.1	121.9	122.0
Crosswalk Width (ft)	12.0	12.0	12.0	12.0
Total Number of Lanes Crossed	3	3	7	7
Number of Right-Turn Islands	0	0	0	0
Type of Control	Actuated	Actuated	Actuated	Actuated
Corresponding Signal Phase	2	6	8	4
Effective Walk Time (s)	14.0	14.0	14.0	14.0
Right Corner Size A (ft)	9.0	9.0	9.0	9.0
Right Corner Size B (ft)	9.0	9.0	9.0	9.0
Right Corner Curb Radius (ft)	0.0	0.0	0.0	0.0
Right Corner Total Area (sq.ft)	81.00	81.00	81.00	81.00
Ped. Left-Right Flow Rate (p/h)	0	0	0	0
Ped. Right-Left Flow Rate (p/h)	0	0	0	0
Ped. R. Sidewalk Flow Rate (p/h)	0	0	0	0
Veh. Perm. L. Flow in Walk (v/h)	113	66	62	112
Veh. Perm. R. Flow in Walk (v/h)	92	36	149	130
Veh. RTOR Flow in Walk (v/h)	0	0	0	0
85th percentile speed (mph)	35	35	50	50
Right Corner Area per Ped (sq.ft)	0.0	0.0	0.0	0.0
Right Corner Quality of Service	-	-	-	-
Ped. Circulation Area (sq.ft)	0.0	0.0	0.0	0.0
Crosswalk Circulation Code	-	-	-	-
Pedestrian Delay (s/p)	61.7	61.7	61.7	61.7
Pedestrian Compliance Code	Poor	Poor	Poor	Poor
Pedestrian Crosswalk Score	2.43	2.29	3.36	3.44
Pedestrian Crosswalk LOS	B	B	C	C

Approach	EB	WB	NB	SB
Bicycle Flow Rate (bike/h)	0	0	0	0
Total Flow Rate (veh/h)	416	382	1565	1202
Effct. Green for Bike (s)	33.4	33.4	81.0	76.7
Cross Street Width (ft)	121.9	122.0	34.1	34.0
Through Lanes Number	1	1	3	3
Through Lane Width (ft)	11.0	11.0	12.0	12.0
Bicycle Lane Width (ft)	0.0	0.0	5.0	5.0
Striped Parking Lane Width (ft)	0.0	0.0	0.0	0.0
Paved Shoulder Width (ft)	3.0	3.0	0.0	0.0
Curb Is Present?	No	No	No	No
On Street Parking?	No	No	No	No
Bicycle Lane Capacity (bike/h)	445	445	1080	1023
Bicycle Delay (s/bike)	45.3	45.3	15.9	17.9
Bicycle Compliance	Poor	Poor	Fair	Fair
Bicycle LOS Score	3.68	3.63	1.87	1.67
Bicycle LOS	D	D	B	B

Lanes and Geometrics

3: Nova Rd & Madeline Ave

2025 No Build PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	105	225	171	79	177	80	210	1327	75	98	1396	151
Future Volume (vph)	105	225	171	79	177	80	210	1327	75	98	1396	151
Satd. Flow (prot)	1662	1703	0	1745	1716	0	1787	5050	0	1787	5054	0
Flt Permitted	0.411			0.165			0.950			0.950		
Satd. Flow (perm)	719	1703	0	303	1716	0	1787	5050	0	1787	5054	0
Satd. Flow (RTOR)		24			14			7			14	
Lane Group Flow (vph)	106	400	0	80	260	0	212	1416	0	99	1563	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8			4								
Total Split (s)	53.0	53.0		53.0	53.0		36.0	81.8		25.2	71.0	
Total Lost Time (s)	11.5	8.5		11.5	8.5		8.6	7.1		8.6	7.1	
Act Effect Green (s)	37.4	40.4		37.4	40.4		23.2	81.8		13.6	72.2	
Actuated g/C Ratio	0.23	0.25		0.23	0.25		0.14	0.51		0.08	0.45	
v/c Ratio	0.63	0.89		1.14	0.59		0.82	0.55		0.65	0.68	
Control Delay	71.8	76.5		202.5	54.6		90.1	28.4		90.3	37.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	71.8	76.5		202.5	54.6		90.1	28.4		90.3	37.8	
LOS	E	E		F	D		F	C		F	D	
Approach Delay		75.5			89.4			36.4			40.9	
Approach LOS		E			F			D			D	

Intersection Summary

Cycle Length: 160

Actuated Cycle Length: 160

Offset: 153 (96%), Referenced to phase 2:SBT and 6:NBT, Start of Yellow

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.14

Intersection Signal Delay: 47.4

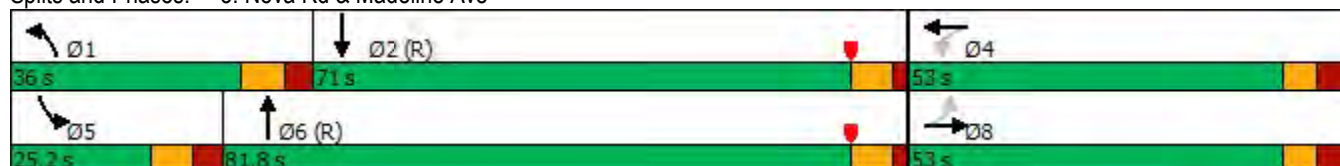
Intersection LOS: D

Intersection Capacity Utilization 103.2%

ICU Level of Service G

Analysis Period (min) 15

Splits and Phases: 3: Nova Rd & Madeline Ave



Network Totals

Number of Intersections	1
Total Delay (hr)	54
Stops (#)	3149
Average Speed (mph)	11
Total Travel Time (hr)	70
Distance Traveled (mi)	758
Fuel Consumed (gal)	108
Fuel Economy (mpg)	7.0
Unserved Vehicles (#)	1
Vehicles in dilemma zone (#)	109
Performance Index	62.6

























Approach	EB	WB	NB	SB
Crosswalk Length (ft)	34.0	34.1	121.9	122.0
Crosswalk Width (ft)	12.0	12.0	12.0	12.0
Total Number of Lanes Crossed	3	3	7	7
Number of Right-Turn Islands	0	0	0	0
Type of Control	Actuated	Actuated	Actuated	Actuated
Corresponding Signal Phase	2	6	8	4
Effective Walk Time (s)	14.0	14.0	14.0	14.0
Right Corner Size A (ft)	9.0	9.0	9.0	9.0
Right Corner Size B (ft)	9.0	9.0	9.0	9.0
Right Corner Curb Radius (ft)	0.0	0.0	0.0	0.0
Right Corner Total Area (sq.ft)	81.00	81.00	81.00	81.00
Ped. Left-Right Flow Rate (p/h)	0	0	0	0
Ped. Right-Left Flow Rate (p/h)	0	0	0	0
Ped. R. Sidewalk Flow Rate (p/h)	0	0	0	0
Veh. Perm. L. Flow in Walk (v/h)	210	98	79	105
Veh. Perm. R. Flow in Walk (v/h)	151	75	171	80
Veh. RTOR Flow in Walk (v/h)	0	0	0	0
85th percentile speed (mph)	35	35	50	50
Right Corner Area per Ped (sq.ft)	0.0	0.0	0.0	0.0
Right Corner Quality of Service	-	-	-	-
Ped. Circulation Area (sq.ft)	0.0	0.0	0.0	0.0
Crosswalk Circulation Code	-	-	-	-
Pedestrian Delay (s/p)	66.6	66.6	66.6	66.6
Pedestrian Compliance Code	Poor	Poor	Poor	Poor
Pedestrian Crosswalk Score	2.66	2.39	3.50	3.51
Pedestrian Crosswalk LOS	C	B	C	D

Approach	EB	WB	NB	SB
Bicycle Flow Rate (bike/h)	0	0	0	0
Total Flow Rate (veh/h)	506	340	1628	1662
Effct. Green for Bike (s)	40.4	40.4	81.8	72.2
Cross Street Width (ft)	121.9	122.0	34.1	34.0
Through Lanes Number	1	1	3	3
Through Lane Width (ft)	11.0	11.0	12.0	12.0
Bicycle Lane Width (ft)	0.0	0.0	5.0	5.0
Striped Parking Lane Width (ft)	0.0	0.0	0.0	0.0
Paved Shoulder Width (ft)	3.0	3.0	0.0	0.0
Curb Is Present?	No	No	No	No
On Street Parking?	No	No	No	No
Bicycle Lane Capacity (bike/h)	505	505	1023	902
Bicycle Delay (s/bike)	44.7	44.7	19.1	24.1
Bicycle Compliance	Poor	Poor	Fair	Fair
Bicycle LOS Score	3.83	3.56	1.90	1.92
Bicycle LOS	D	D	B	B

Lanes and Geometrics

3: Nova Rd & Madeline Ave

2025 Build AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	112	113	149	62	152	130	113	1259	36	66	924	92
Future Volume (vph)	112	113	149	62	152	130	113	1259	36	66	924	92
Satd. Flow (prot)	1728	1818	1561	1745	1801	1531	1805	5068	0	1805	4974	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1728	1818	1561	1745	1801	1531	1805	5068	0	1805	4974	0
Satd. Flow (RTOR)			271			271		4			14	
Lane Group Flow (vph)	124	126	166	69	169	144	126	1439	0	73	1129	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases			8			4						
Total Split (s)	21.0	38.7	38.7	18.9	36.6	36.6	20.7	46.0		16.4	41.7	
Total Lost Time (s)	8.5	8.5	8.5	8.5	8.5	8.5	8.6	7.1		8.6	7.1	
Act Effect Green (s)	11.7	18.7	18.7	13.6	17.6	17.6	13.4	53.5		7.6	44.6	
Actuated g/C Ratio	0.10	0.16	0.16	0.11	0.15	0.15	0.11	0.45		0.06	0.37	
v/c Ratio	0.74	0.45	0.35	0.35	0.64	0.32	0.63	0.64		0.63	0.61	
Control Delay	77.6	52.5	2.1	53.0	58.7	1.8	64.7	29.3		79.4	33.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	77.6	52.5	2.1	53.0	58.7	1.8	64.7	29.3		79.4	33.4	
LOS	E	D	A	D	E	A	E	C		E	C	
Approach Delay		39.9			36.2			32.1			36.2	
Approach LOS		D			D			C			D	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.74

Intersection Signal Delay: 34.8

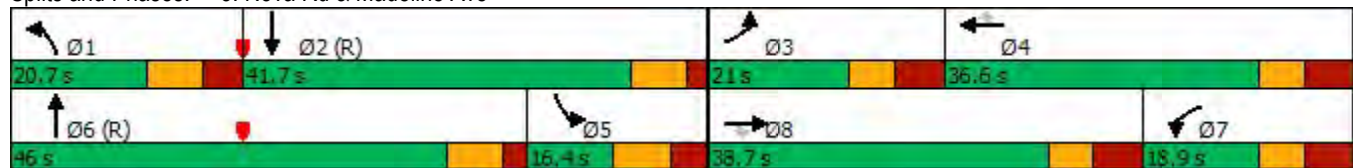
Intersection LOS: C

Intersection Capacity Utilization 73.6%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 3: Nova Rd & Madeline Ave



3: Nova Rd & Madeline Ave

























Direction	All
Future Volume (vph)	3208
Total Delay (hr)	31
Stops (#)	2365
Average Speed (mph)	13
Total Travel Time (hr)	44
Distance Traveled (mi)	587
Fuel Consumed (gal)	76
Fuel Economy (mpg)	7.7
Unserved Vehicles (#)	0
Vehicles in dilemma zone (#)	103

Approach	EB	WB	NB	SB
Crosswalk Length (ft)	45.1	45.0	122.7	122.5
Crosswalk Width (ft)	12.0	12.0	12.0	12.0
Total Number of Lanes Crossed	4	4	7	7
Number of Right-Turn Islands	0	0	0	0
Type of Control	Actuated	Actuated	Actuated	Actuated
Corresponding Signal Phase	2	6	8	4
Effective Walk Time (s)	14.0	14.0	14.0	14.0
Right Corner Size A (ft)	9.0	9.0	9.0	9.0
Right Corner Size B (ft)	9.0	9.0	9.0	9.0
Right Corner Curb Radius (ft)	0.0	0.0	0.0	0.0
Right Corner Total Area (sq.ft)	81.00	81.00	81.00	81.00
Ped. Left-Right Flow Rate (p/h)	0	0	0	0
Ped. Right-Left Flow Rate (p/h)	0	0	0	0
Ped. R. Sidewalk Flow Rate (p/h)	0	0	0	0
Veh. Perm. L. Flow in Walk (v/h)	113	66	62	112
Veh. Perm. R. Flow in Walk (v/h)	92	36	149	130
Veh. RTOR Flow in Walk (v/h)	0	0	0	0
85th percentile speed (mph)	35	35	50	50
Right Corner Area per Ped (sq.ft)	0.0	0.0	0.0	0.0
Right Corner Quality of Service	-	-	-	-
Ped. Circulation Area (sq.ft)	0.0	0.0	0.0	0.0
Crosswalk Circulation Code	-	-	-	-
Pedestrian Delay (s/p)	61.7	61.7	61.7	61.7
Pedestrian Compliance Code	Poor	Poor	Poor	Poor
Pedestrian Crosswalk Score	2.55	2.42	3.36	3.44
Pedestrian Crosswalk LOS	C	B	C	C

Approach	EB	WB	NB	SB
Bicycle Flow Rate (bike/h)	0	0	0	0
Total Flow Rate (veh/h)	416	382	1565	1202
Effct. Green for Bike (s)	27.1	20.4	73.2	68.9
Cross Street Width (ft)	122.7	122.5	45.0	45.1
Through Lanes Number	1	1	3	3
Through Lane Width (ft)	11.0	11.0	12.0	12.0
Bicycle Lane Width (ft)	0.0	0.0	5.0	5.0
Striped Parking Lane Width (ft)	0.0	0.0	0.0	0.0
Paved Shoulder Width (ft)	3.0	3.0	0.0	0.0
Curb Is Present?	No	No	No	No
On Street Parking?	No	No	No	No
Bicycle Lane Capacity (bike/h)	361	272	976	919
Bicycle Delay (s/bike)	50.3	56.0	19.7	21.9
Bicycle Compliance	Poor	Poor	Fair	Fair
Bicycle LOS Score	3.69	3.64	2.04	1.84
Bicycle LOS	D	D	B	B

Lanes and Geometrics
3: Nova Rd & Madeline Ave

2025 Build PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	105	225	171	79	177	80	210	1327	75	95	1396	151
Future Volume (vph)	105	225	171	79	177	80	210	1327	75	95	1396	151
Satd. Flow (prot)	1662	1837	1531	1745	1801	1531	1787	5050	0	1787	5054	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1662	1837	1531	1745	1801	1531	1787	5050	0	1787	5054	0
Satd. Flow (RTOR)			250			250		8			15	
Lane Group Flow (vph)	106	227	173	80	179	81	212	1416	0	96	1563	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases			8			4						
Total Split (s)	19.0	31.2	31.2	17.8	30.0	30.0	29.0	59.0		22.0	52.0	
Total Lost Time (s)	8.5	8.5	8.5	8.5	8.5	8.5	8.6	7.1		8.6	7.1	
Act Effect Green (s)	10.7	20.4	20.4	9.1	18.8	18.8	18.7	56.4		11.4	49.1	
Actuated g/C Ratio	0.08	0.16	0.16	0.07	0.14	0.14	0.14	0.43		0.09	0.38	
v/c Ratio	0.78	0.79	0.38	0.66	0.69	0.19	0.82	0.65		0.61	0.81	
Control Delay	93.6	72.0	3.1	84.0	66.3	0.9	79.2	31.3		73.6	41.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	93.6	72.0	3.1	84.0	66.3	0.9	79.2	31.3		73.6	41.1	
LOS	F	E	A	F	E	A	E	C		E	D	
Approach Delay		53.0			54.9			37.5			43.0	
Approach LOS		D			D			D			D	

Intersection Summary

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 43.1

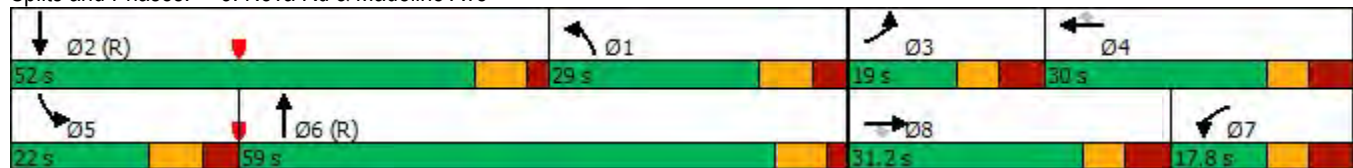
Intersection LOS: D

Intersection Capacity Utilization 85.4%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 3: Nova Rd & Madeline Ave



Network Totals

Number of Intersections	1
Total Delay (hr)	49
Stops (#)	3241
Average Speed (mph)	12
Total Travel Time (hr)	65
Distance Traveled (mi)	757
Fuel Consumed (gal)	107
Fuel Economy (mpg)	7.1
Unserved Vehicles (#)	0
Vehicles in dilemma zone (#)	126
Performance Index	57.9

Approach	EB	WB	NB	SB
Crosswalk Length (ft)	45.1	45.0	122.7	122.5
Crosswalk Width (ft)	12.0	12.0	12.0	12.0
Total Number of Lanes Crossed	4	4	7	7
Number of Right-Turn Islands	0	0	0	0
Type of Control	Actuated	Actuated	Actuated	Actuated
Corresponding Signal Phase	2	6	8	4
Effective Walk Time (s)	14.0	14.0	14.0	14.0
Right Corner Size A (ft)	9.0	9.0	9.0	9.0
Right Corner Size B (ft)	9.0	9.0	9.0	9.0
Right Corner Curb Radius (ft)	0.0	0.0	0.0	0.0
Right Corner Total Area (sq.ft)	81.00	81.00	81.00	81.00
Ped. Left-Right Flow Rate (p/h)	0	0	0	0
Ped. Right-Left Flow Rate (p/h)	0	0	0	0
Ped. R. Sidewalk Flow Rate (p/h)	0	0	0	0
Veh. Perm. L. Flow in Walk (v/h)	210	95	79	105
Veh. Perm. R. Flow in Walk (v/h)	151	75	171	80
Veh. RTOR Flow in Walk (v/h)	0	0	0	0
85th percentile speed (mph)	35	35	50	50
Right Corner Area per Ped (sq.ft)	0.0	0.0	0.0	0.0
Right Corner Quality of Service	-	-	-	-
Ped. Circulation Area (sq.ft)	0.0	0.0	0.0	0.0
Crosswalk Circulation Code	-	-	-	-
Pedestrian Delay (s/p)	66.6	66.6	66.6	66.6
Pedestrian Compliance Code	Poor	Poor	Poor	Poor
Pedestrian Crosswalk Score	2.75	2.50	3.50	3.51
Pedestrian Crosswalk LOS	C	C	C	D

Approach	EB	WB	NB	SB
Bicycle Flow Rate (bike/h)	0	0	0	0
Total Flow Rate (veh/h)	506	340	1628	1659
Effct. Green for Bike (s)	25.6	23.2	80.9	70.5
Cross Street Width (ft)	122.7	122.5	45.0	45.1
Through Lanes Number	1	1	3	3
Through Lane Width (ft)	11.0	11.0	12.0	12.0
Bicycle Lane Width (ft)	0.0	0.0	5.0	5.0
Striped Parking Lane Width (ft)	0.0	0.0	0.0	0.0
Paved Shoulder Width (ft)	3.0	3.0	0.0	0.0
Curb Is Present?	No	No	No	No
On Street Parking?	No	No	No	No
Bicycle Lane Capacity (bike/h)	320	290	1011	881
Bicycle Delay (s/bike)	56.4	58.5	19.6	25.0
Bicycle Compliance	Poor	Poor	Fair	Fair
Bicycle LOS Score	3.84	3.57	2.07	2.09
Bicycle LOS	D	D	B	B

APPENDIX F:
Supporting Documentation for B/C Analysis

FDOT Long Range Estimating System - Production

R3: Project Details by Sequence Report

Project: 101010-1-52-01

Letting Date: 01/2099

Description: VHB Project# 663308.06 Madeline Avenue

District: 05 County: 79 VOLUSIA Market Area: 06 Units: English

Contract Class: Lump Sum Project: N Design/Build: N Project Length: 0.232 MI

Project Manager:

Version 45 Project Grand Total

\$455,739.90

Description: Madeline Avenue

Sequence: 1 WUR - Widen/Resurface, Undivided, Rural

Net Length: 0.109 MI
575 LF

Description: Madeline (Eastbound)

EARTHWORK COMPONENT

User Input Data

Description	Value
Standard Clearing and Grubbing Limits L/R	30.00 / 30.00
Incidental Clearing and Grubbing Area	0.00
Alignment Number	1
Distance	0.232
Top of Structural Course For Begin Section	102.00
Top of Structural Course For End Section	102.00
Horizontal Elevation For Begin Section	100.00
Horizontal Elevation For End Section	100.00
Existing Front Slope L/R	6 to 1 / 6 to 1
Existing Outside Shoulder Cross Slope L/R	6.00 % / 6.00 %
Front Slope L/R	6 to 1 / 6 to 1
Outside Shoulder Cross Slope L/R	6.00 % / 6.00 %
Roadway Cross Slope L/R	2.00 % / 2.00 %

X-Items

Pay item	Description	Quantity Unit	Unit Price	Extended Amount
110-1-1	CLEARING & GRUBBING	0.31 AC	\$26,786.74	\$8,303.89
120-1	REGULAR EXCAVATION	251.00 CY	\$32.84	\$8,242.84
120-6	EMBANKMENT	125.00 CY	\$35.42	\$4,427.50
Earthwork Component Total				\$20,974.23

ROADWAY COMPONENT

User Input Data

Description	Value
Number of Lanes	2
Existing Roadway Pavement Width L/R	10.00 / 10.00
Structural Spread Rate	165
Friction Course Spread Rate	80
Widened Outside Pavement Width L/R	2.00 / 2.00
Widened Structural Spread Rate	275
Widened Friction Course Spread Rate	165

X-Items

Pay item	Description	Quantity	Unit	Unit Price	Extended Amount
285-706	OPTIONAL BASE,BASE GROUP 06	633.00	SY	\$47.32	\$29,953.56
327-70-1	MILLING EXIST ASPH PAVT, 1" AVG DEPTH	146.00	SY	\$10.33	\$1,508.18
327-70-6	MILLING EXIST ASPH PAVT,1 1/2" AVG DEPTH	1,918.00	SY	\$1.76	\$3,375.68
334-1-12	SUPERPAVE ASPHALTIC CONC, TRAFFIC B	8.00	TN	\$144.47	\$1,155.76
334-1-13	SUPERPAVE ASPHALTIC CONC, TRAFFIC C	52.00	TN	\$133.02	\$6,917.04
337-7-83	ASPH CONC FC,TRAFFIC C,FC-12.5,PG 76-22	210.00	TN	\$127.45	\$26,764.50
710-11-101	PAINTED PAVT MARK,STD,WHITE,SOLID,6"	0.28	GM	\$1,098.71	\$307.64
710-11-123	PAINTED PAVT MARK,STD,WHITE,SOLID, 12"	154.00	LF	\$1.11	\$170.94
710-11-125	PAINTED PAVT MARK,STD,WHITE,SOLID,24"	149.00	LF	\$2.12	\$315.88
710-11-131	PAINTED PAVT MARK,STD,WHITE,SKIP, 6"	0.01	GM	\$511.79	\$5.12
710-11-201	PAINTED PAVT MARK,STD,YELLOW,SOLID,6"	0.33	GM	\$1,074.80	\$354.68
710-11-224	PAINTED PAVT MARK,STD,YELLOW,SOLID,18"	232.00	LF	\$1.57	\$364.24
711-11-170	THERMOPLASTIC, STD, WHITE, ARROW	5.00	EA	\$67.65	\$338.25

Pavement Marking Subcomponent

Description	Value
Include Thermo/Tape/Other	N
Pavement Type	Asphalt
Solid Stripe No. of Paint Applications	2
Solid Stripe No. of Stripes	2
Skip Stripe No. of Paint Applications	2
Skip Stripe No. of Stripes	1

Roadway Component Total

\$71,531.47

SHOULDER COMPONENT**User Input Data**

Description	Value
Existing Total Outside Shoulder Width L/R	10.00 / 10.00
New Total Outside Shoulder Width L/R	10.00 / 10.00
Total Outside Shoulder Perf. Turf Width L/R	2.67 / 2.67
Existing Paved Outside Shoulder Width L/R	5.00 / 5.00
New Paved Outside Shoulder Width L/R	5.00 / 5.00
Structural Spread Rate	110
Friction Course Spread Rate	80
Total Width (T) / 8" Overlap (O)	T
Rumble Strips i/c 1/2 No. of Sides	0

X-Items

Pay item	Description	Quantity	Unit	Unit Price	Extended Amount
520-1-10	CONCRETE CURB & GUTTER, TYPE F	178.00	LF	\$31.66	\$5,635.48

520-2-4	CONCRETE CURB, TYPE D	38.00 LF	\$33.25	\$1,263.50
520-3	VALLEY GUTTER- CONCRETE	60.00 LF	\$48.95	\$2,937.00
522-1	CONCRETE SIDEWALK AND DRIVEWAYS, 4"	121.00 SY	\$56.71	\$6,861.91
522-2	CONCRETE SIDEWALK AND DRIVEWAYS, 6"	54.00 SY	\$66.98	\$3,616.92
570-1-2	PERFORMANCE TURF, SOD	472.00 SY	\$3.97	\$1,873.84

Erosion Control

Pay Items

Pay item	Description	Quantity Unit	Unit Price	Extended Amount
104-10-3	SEDIMENT BARRIER	528.00 LF	\$1.49	\$786.72
104-18	INLET PROTECTION SYSTEM	2.00 EA	\$104.09	\$208.18
107-1	LITTER REMOVAL	1.00 AC	\$33.96	\$33.96
107-2	MOWING	0.50 AC	\$52.03	\$26.02

Shoulder Component Total

\$23,243.52

DRAINAGE COMPONENT

X-Items

Pay item	Description	Quantity Unit	Unit Price	Extended Amount
425-1-361	INLETS, CURB, TYPE P-6, <10'	1.00 EA	\$7,563.48	\$7,563.48
425-2-63	MANHOLES, P-8, PARTIAL	1.00 EA	\$5,466.05	\$5,466.05
430-174-118	PIPE CULV, OPT MATL, ROUND,18"SD	16.00 LF	\$144.25	\$2,308.00

Drainage Component Total

\$15,337.53

SIGNING COMPONENT

Pay Items

Pay item	Description	Quantity Unit	Unit Price	Extended Amount
700-1-11	SINGLE POST SIGN, F&I GM, <12 SF	3.00 AS	\$413.04	\$1,239.12

Signing Component Total

\$1,239.12

Sequence 1 Total

\$132,325.87

Sequence: 2 WUR - Widen/Resurface, Undivided, Rural

Net Length:

0.096 MI
504 LF

Description: Madeline (Westbound)

EARTHWORK COMPONENT

User Input Data

Description	Value
Standard Clearing and Grubbing Limits L/R	30.00 / 30.00
Incidental Clearing and Grubbing Area	0.00
Alignment Number	1
Distance	0.096
Top of Structural Course For Begin Section	102.00
Top of Structural Course For End Section	102.00
Horizontal Elevation For Begin Section	100.00

Horizontal Elevation For End Section	100.00
Existing Front Slope L/R	6 to 1 / 6 to 1
Existing Outside Shoulder Cross Slope L/R	6.00 % / 6.00 %
Front Slope L/R	6 to 1 / 6 to 1
Outside Shoulder Cross Slope L/R	6.00 % / 6.00 %
Roadway Cross Slope L/R	2.00 % / 2.00 %

X-Items

Pay item	Description	Quantity Unit	Unit Price	Extended Amount
110-1-1	CLEARING & GRUBBING	0.40 AC	\$26,786.74	\$10,714.70
120-1	REGULAR EXCAVATION	285.00 CY	\$32.84	\$9,359.40
120-6	EMBANKMENT	143.00 CY	\$35.42	\$5,065.06
Earthwork Component Total				\$25,139.16

ROADWAY COMPONENT

User Input Data

Description	Value
Number of Lanes	2
Existing Roadway Pavement Width L/R	10.00 / 10.00
Structural Spread Rate	165
Friction Course Spread Rate	80
Widened Outside Pavement Width L/R	2.00 / 2.00
Widened Structural Spread Rate	275
Widened Friction Course Spread Rate	165

X-Items

Pay item	Description	Quantity Unit	Unit Price	Extended Amount
285-706	OPTIONAL BASE,BASE GROUP 06	550.00 SY	\$47.32	\$26,026.00
327-70-6	MILLING EXIST ASPH PAVT,1 1/2" AVG DEPTH	1,609.00 SY	\$1.76	\$2,831.84
334-1-13	SUPERPAVE ASPHALTIC CONC, TRAFFIC C	45.00 TN	\$133.02	\$5,985.90
337-7-83	ASPH CONC FC,TRAFFIC C,FC-12.5,PG 76-22	178.00 TN	\$127.45	\$22,686.10
710-11-101	PAINTED PAVT MARK,STD,WHITE,SOLID,6"	0.26 GM	\$1,098.71	\$285.66
710-11-123	PAINTED PAVT MARK,STD,WHITE,SOLID, 12"	103.00 LF	\$1.11	\$114.33
710-11-125	PAINTED PAVT MARK,STD,WHITE,SOLID,24"	125.00 LF	\$2.12	\$265.00
710-11-131	PAINTED PAVT MARK,STD,WHITE,SKIP, 6"	0.02 GM	\$511.79	\$10.24
710-11-170	PAINTED PAVT MARK,STD,WHITE, ARROWS	5.00 EA	\$36.68	\$183.40
710-11-201	PAINTED PAVT MARK,STD,YELLOW,SOLID,6"	0.24 GM	\$1,074.80	\$257.95
710-11-224	PAINTED PAVT MARK,STD,YELLOW,SOLID,18"	93.00 LF	\$1.57	\$146.01

Pavement Marking Subcomponent

Description	Value
Include Thermo/Tape/Other	N
Pavement Type	Asphalt
Solid Stripe No. of Paint Applications	2
Solid Stripe No. of Stripes	2
Skip Stripe No. of Paint Applications	2

Roadway Component Total

\$58,792.43

SHOULDER COMPONENT**User Input Data**

Description	Value
Existing Total Outside Shoulder Width L/R	10.00 / 10.00
New Total Outside Shoulder Width L/R	10.00 / 10.00
Total Outside Shoulder Perf. Turf Width L/R	2.67 / 2.67
Existing Paved Outside Shoulder Width L/R	5.00 / 5.00
New Paved Outside Shoulder Width L/R	5.00 / 5.00
Structural Spread Rate	110
Friction Course Spread Rate	80
Total Width (T) / 8" Overlap (O)	T
Rumble Strips 1/2 No. of Sides	0

X-Items

Pay item	Description	Quantity	Unit	Unit Price	Extended Amount
520-1-10	CONCRETE CURB & GUTTER, TYPE F	841.00	LF	\$31.66	\$26,626.06
522-1	CONCRETE SIDEWALK AND DRIVEWAYS, 4"	388.00	SY	\$56.71	\$22,003.48
522-2	CONCRETE SIDEWALK AND DRIVEWAYS, 6"	63.00	SY	\$66.98	\$4,219.74
570-1-2	PERFORMANCE TURF, SOD	706.00	SY	\$3.97	\$2,802.82

Erosion Control**Pay Items**

Pay item	Description	Quantity	Unit	Unit Price	Extended Amount
104-10-3	SEDIMENT BARRIER	835.00	LF	\$1.49	\$1,244.15
104-12	STAKED TURBIDITY BARRIER-NYL REINF PVC	24.00	LF	\$5.29	\$126.96
104-18	INLET PROTECTION SYSTEM	4.00	EA	\$104.09	\$416.36
107-1	LITTER REMOVAL	0.44	AC	\$33.96	\$14.94
107-2	MOWING	0.22	AC	\$52.03	\$11.45

Shoulder Component Total

\$57,465.96

DRAINAGE COMPONENT**X-Items**

Pay item	Description	Quantity	Unit	Unit Price	Extended Amount
425-1-361	INLETS, CURB, TYPE P-6, <10'	3.00	EA	\$7,563.48	\$22,690.44
425-2-63	MANHOLES, P-8, PARTIAL	3.00	EA	\$5,466.05	\$16,398.15
430-174-124	PIPE CULV, OPT MATL, ROUND, 24" SD	320.00	LF	\$132.37	\$42,358.40
430-984-129	MITERED END SECT, OPTIONAL RD, 24" SD	1.00	EA	\$2,299.56	\$2,299.56

Drainage Component Total

\$83,746.55

SIGNING COMPONENT**Pay Items**

Pay item	Description	Quantity	Unit	Unit Price	Extended Amount
700-1-11	SINGLE POST SIGN, F&I GM, <12 SF	3.00	AS	\$413.04	\$1,239.12
Signing Component Total					\$1,239.12

Sequence 2 Total \$226,383.22

Date: 1/27/2022 1:22:09 PM

FDOT Long Range Estimating System - Production

R3: Project Details by Sequence Report

Project: 101010-1-52-01

Letting Date: 01/2099

Description: VHB Project# 663308.06 Madeline Avenue

District: 05

County: 79 VOLUSIA

Market Area: 06

Units: English

Contract Class:

Lump Sum Project: N

Design/Build: N

Project Length: 0.232 MI

Project Manager:

Version 45 Project Grand Total

\$455,739.90

Description: Madeline Avenue

Project Sequences Subtotal **\$358,709.09**

102-1	Maintenance of Traffic	10.00 %	\$35,870.91
101-1	Mobilization	10.00 %	\$39,458.00

Project Sequences Total **\$434,038.00**

Project Unknowns	0.00 %	\$0.00
Design/Build	0.00 %	\$0.00

Non-Bid Components:

Pay item	Description	Quantity	Unit	Unit Price	Extended Amount
999-25	INITIAL CONTINGENCY AMOUNT (DO NOT BID)		LS	\$21,701.90	\$21,701.90
Project Non-Bid Subtotal					\$21,701.90

Version 45 Project Grand Total

\$455,739.90

PRELIMINARY COST ESTIMATE - SIGNAL

Madeline Avenue at Nova Road Intersection Improvements

Pay Item	Pay Item Description	Unit	Quantity	Unit Price	Total Cost
630-2-11	CONDUIT, FURNISH & INSTALL, OPEN TRENCH	LF	250	\$13.45	\$3,362.50
630-2-12	CONDUIT, FURNISH & INSTALL, DIRECTIONAL BORE	LF	500	\$26.75	\$13,375.00
632-7-1	SIGNAL CABLE- NEW OR RECONSTRUCTED INTERSECTION, FURNISH & INSTALL	PI	1	\$7,010.00	\$7,010.00
633-8-1	MULTI-CONDUCTOR COMMUNICATION CABLE, FURNISH & INSTALL	LF	150	\$5.70	\$855.00
635-2-11	PULL & SPLICE BOX, F&I, 13" x 24" COVER SIZE	EA	20	\$915.00	\$18,300.00
635-2-12	PULL & SPLICE BOX, F&I, 24" x 36" COVER SIZE	EA	2	\$1,810.00	\$3,620.00
646-1-11	ALUMINUM SIGNALS POLE, PEDESTAL	EA	8	\$1,800.00	\$14,400.00
649-21-21	STEEL MAST ARM ASSEMBLY, FURNISH AND INSTALL, SINGLE ARM 78'	EA	1	\$81,000.00	\$81,000.00
649-21-27	STEEL MAST ARM ASSEMBLY, FURNISH AND INSTALL, DOUBLE ARM 78'-78'	EA	1	\$105,550.00	\$105,550.00
649-26-3	STEEL MAST ARM ASSEMBLY, REMOVE, SHALLOW FOUNDATION - BOLT ON ATTACHMENT	EA	2	\$4,255.00	\$8,510.00
650-1-14	VEHICULAR TRAFFIC SIGNAL (F&I- ALUMINUM) (3 SECTION, 1 WAY)	AS	12	\$1,145.00	\$13,740.00
650-1-46	VEHICULAR TRAFFIC SIGNAL, FURNISH & INSTALL PROGRAMMABLE, (4 SECTION, 1 WAY)	EA	2	\$5,775.00	\$11,550.00
653-1-11	PEDESTRIAN SIGNAL, FURNISH & INSTALL LED COUNTDOWN, 1 WAY	AS	6	\$785.00	\$4,710.00
653-1-12	PEDESTRIAN SIGNAL, FURNISH & INSTALL LED COUNTDOWN, 2 WAY	AS	3	\$1,380.00	\$4,140.00
665-1-11	PEDESTRIAN DETECTOR, FURNISH & INSTALL, STANDARD	EA	12	\$290.00	\$3,480.00
660-4-11	VEHICLE DETECTION SYSTEM- VIDEO, FURNISH & INSTALL CABINET EQUIPMENT	EA	1	\$11,005.00	\$11,005.00
660-4-12	VEHICLE DETECTION SYSTEM- VIDEO, FURNISH & INSTALL ABOVE GROUND EQUIPMENT	EA	4	\$5,110.00	\$20,440.00
663-1-111	SIGNAL PRIORITY AND PREEMPTION SYSTEM (F&I) (OPTICAL) (CABINET ELECTRONICS)	EA	1	\$5,665.00	\$5,665.00
663-1-112	SIGNAL PRIORITY AND PREEMPTION SYSTEM (F&I) (OPTICAL) (DETECTORS)	EA	4	\$1,770.00	\$7,080.00
682-1400	ITS CCTV CAMERA, RELOCATE (Existing Grid Smart Camera)	EA	1	\$2,000.00	\$2,000.00
700-5-22	INTERNALLY ILLUMINATED SIGN (F&I- OVERHEAD MOUNT) (12 SF TO 18 SF)	EA	4	\$4,050.00	\$16,200.00
715-1-12	LIGHTING CONDUCTORS, F&I, INSULATED, NO.8 - 6	LF	4,176	\$2.50	\$10,440.00
715-4-13	LIGHT POLE COMPLETE, FURNISH & INSTALL STANDARD POLE STANDARD FOUNDATION, 40' MOUNTING HEIGHT	EA	8	\$7,765.00	\$62,120.00
715-4-70	LIGHT POLE COMPLETE, REMOVE POLE AND FOUNDATION	EA	8	\$840.00	\$6,720.00
715-500-1	POLE CABLE DISTRIBUTION SYSTEM, FURNISH AND INSTALL, CONVENTIONAL	EA	8	\$815.00	\$6,520.00

Notes:	SUBTOTAL	\$441,792.50
1. Unit prices based on current FDOT 6 Month Moving Statewide Averages	MOBILIZATION (10%)	\$44,179.25
2. Estimate assumes new mast arms due to EB right turn lane improvement & structural analysis not meeting current design standards with additional loadings	MAINTENANCE OF TRAFFIC (10%)	\$48,597.18
3. Estimate includes enhanced pedestrian lighting at the intersection	PROJECT UNKNOWNNS (10%)	\$44,179.25
TOTAL SIGNAL ESTIMATED PROJECT COSTS		\$578,748.18



Inflation Factors

This “*Transportation Costs*” report is issued by the Office of Policy Planning. It provides information on inflation factors and other indices that may be used to convert Present Day Costs (PDC) to future Year Of Expenditure costs (YOE) or vice versa. This report is updated regularly based on the FDOT Work Program Instructions.

Please note that the methodology for inflationary adjustments relating to specific transportation projects should be addressed with the district office where the project will be located. For general use or non-specific areas, the guidelines provided herein may be used for inflationary adjustments.

Construction Cost Inflation Factors

The table on the next page includes the inflation factors and Present Day Cost (PDC) multipliers that are applied to the Department’s Work Program for highway construction costs expressed in Fiscal Year 2022 dollars (FY 2022 runs from July 1, 2021 to June 30, 2022).

Other Transportation Cost Inflation Factors

Other indices may be used to adjust project costs for other transportation modes or non-construction components of costs. Examples are as follows:

The Consumer Price Index (CPI, also retail price index) is a weighted average of prices of a specified set of products and services purchased by wage earners in urban areas. As such, it provides one measure of inflation. The CPI is a fixed quantity price index and a reasonable cost-of-living index.

The Employment Cost Index (ECI) is based on the National Compensation Survey, administered by the Bureau of Labor Statistics (BLS). It measures quarterly changes in compensation costs, which include wages, salaries, and other employer costs for civilian workers (nonfarm private industry and state and local government).

The monthly series, Producer Price Index for Highway and Street Construction, is also available from BLS. It provides national-level estimates of past and recent highway construction inflation. The Producer Price Index (PPI) web site is <http://www.bls.gov/ppi/home.htm>.



FLORIDA DEPARTMENT OF TRANSPORTATION

TRANSPORTATION COSTS REPORTS

Work Program Highway Construction Cost Inflation Factors

Fiscal Year	Inflation Factor	PDC Multiplier
2022	Base	1.000
2023	2.7%	1.027
2024	2.8%	1.056
2025	2.9%	1.086
2026	3.0%	1.119
2027	3.1%	1.154
2028	3.2%	1.191
2029	3.3%	1.230
2030	3.3%	1.270
2031	3.3%	1.312
2032	3.3%	1.356
2033	3.3%	1.400
2034	3.3%	1.447
2035	3.3%	1.494
2036	3.3%	1.544
2037	3.3%	1.595
2038	3.3%	1.647
2039	3.3%	1.702
2040	3.3%	1.758
2041	3.3%	1.816
2042	3.3%	1.876
2043	3.3%	1.938
2044	3.3%	2.002
2045	3.3%	2.068
2046	3.3%	2.136
2047	3.3%	2.206
2048	3.3%	2.279
2049	3.3%	2.354
2050	3.3%	2.432
2051	3.3%	2.512
2052	3.3%	2.595
2053	3.3%	2.681
2054	3.3%	2.769
2055	3.3%	2.861
2056	3.3%	2.955
2057	3.3%	3.053
2058	3.3%	3.153
2059	3.3%	3.257

Operational Benefits Summary			
Benefit Period		Measures of Effectiveness	
		Total Delay (veh-hrs)	Fuel Consumption (gal)
AM Peak Hour	2025 No Build	37.0	77.0
	2025 Build	31.0	76.0
PM Peak Hour	2025 No Build	54.0	108.0
	2025 Build	49.0	107.0
Estimated Daily (AM + PM)	2025 No Build	91	185
	2025 Build	80	183
Estimated Daily Savings [4*(AM+PM)]		44	8
Estimated Unit Cost		\$20.170	\$4.110
Daily User Benefit by MOE		\$887.480	\$32.880
Daily User Benefit Total		920.36	
Annual User Benefit		\$276,108.00	
The service life of the improvement was kept as twenty (20) years.			
Interest rate of 4% was used in arriving at the annual cost of improvements.			

Project Cost (2022)				
		Roadway	Signal	Total
Sub-Total		\$358,709.09	\$441,792.50	\$1,070,358.98
MOT	10%	\$35,870.91	\$44,179.25	
Mobilization	10%	\$39,458.00	\$48,597.18	
Unknowns	10%	\$35,870.91	\$44,179.25	
Initial Contingency Amount	-	\$21,701.90	-	
Total		\$491,610.81	\$578,748.18	

Adjusted Project Costs					
Fiscal Year	Inflation Factor	Multiplier	Roadway Cost	Signal Cost	Total
2022	Base	1.000	\$491,610.81	\$578,748.18	\$1,070,358.98
2023	2.70%	1.027	\$504,884.30	\$594,374.38	\$1,099,258.68
2024	2.80%	1.056	\$519,141.01	\$611,158.07	\$1,130,299.09
2025	2.90%	1.086	\$533,889.34	\$628,520.52	\$1,162,409.86

Benefit-Cost Analysis

District: **Five**

County: **79 - Volusia**

Date Prepared: **04/11/22**

Location: **Madeline Ave & Nova Rd**

Section : Beg. Milepost : End Milepost :

Rdway Type: **2 - 3 Lanes Urban UnDivided**

Control Element: **Other (describe in box below)**

Turn Lane/Signal Improvements

ANNUAL COST OF IMPROVEMENTS

Type	Cost	Service Life	Capital Recovery Factor	Total
ROW		100	0.0408	\$ -
P.E.C.E.I.		15	0.0899	\$ -
Structure		75	0.0425	\$ -
Roadway	\$ 533,889.34	20	0.0736	\$ 39,294.26
Drainage		20	0.0736	\$ -
Signal	\$ 628,520.52	20	0.0736	\$ 46,259.11
Other		20	0.0736	\$ -
Sub-Total	\$ 1,162,409.86			\$ 85,553.37
Annual Cost =				\$ 85,553.37

Total number of crashes = **64**
 # of correctable crashes, PC = **18**
 # of years of crash data, YD = **5**
 PC/YD = **3.60**
 Crash reduction factor, CRF = **99.00%**
 CRF x (PC/YD) = **3.56**
 Cost per crash, CPC = **\$124,618.00**
 Safety Benefit = **\$444,139**
 Operational Benefit = **\$276,108**

Primary crash reduction factor (%): **99**
 Change permissive to protected-only phasing for EBL and WBL

Additional crash reduction factor:

Additional crash reduction factor:

BENEFIT/COST RATIO

$$\frac{\text{Benefit}}{\text{Cost}} = \frac{\$720,246.55}{\$85,553.37} = \mathbf{8.42}$$

1) A Crash Reduction Factor of 99% was used based CMF ID 333 from the cmfclearinghouse.org (Accident Modification Factors for Traffic Engineering and ITS Improvements, Harkey Et Al., 2008); 2) Left and Angle crashes were assumed to be correctable because of the capacity/signal improvements; 3) Operations benefits of \$276,108.00 was added to the safety benefits to get the overall B/C Ratio; 4) Construction cost is represented in 2025 dollar value based on a inflation factor of 2.00%

Prepared by: **VHB**